AUTOMOTIVE INDUSTRIES

PASSENGER CARS • TRUCKS • BUSES • AIRCRAFT • TRACTORS • ENGINES • BODIES • TRAILERS • ROAD MACHINERY • FARM MACHINERY
PARTS AND COMPONENTS • ACCESSORIES • PRODUCTION EQUIPMENT • SERVICE EQUIPMENT • MAINTENANCE EQUIPMENT
ENGINEERING • PRODUCTION • MANAGEMENT

AUGUST 15, 1950

In This Issue . . .

Detroit Viewpoint on War Conversion

Chrome Plating Stainless Steel Grilles

New British Jeep with 80 Hp Engine

Producibility as Applied to Airframes

Russia's Recovery and Industrial Challenge

Complete Table of Contents, Page 3

A CHILTON PUBLICATION

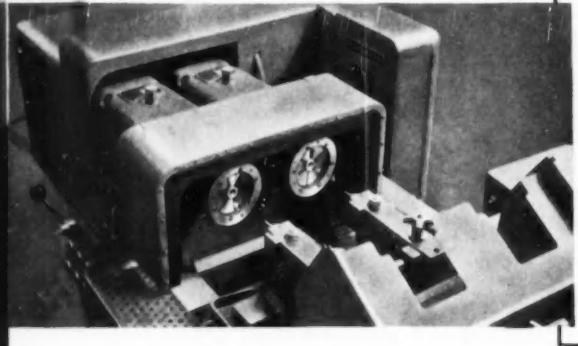
how much is an "hour's worth" of production?

—with a Heald machine, it's GREATER THAN YOU THINK!

The cost of an hour's production is pretty well fixed. But the number of parts you can finish in that time depends on the equipment used. That's why modern Heald machines can make such a big difference in your production costs.

Faster speeds and feeds — automatic cycles — easier operation — higher precision — lower maintenance — all of these Heald features combine to help you get the *most* out of an "hour's worth" of production.

Remember — when it comes to precision finishing, it pays to come to Heald.



New Heald Bore-Matic Doubles Production of tapered die castings per hour

The tapered bores of small die-cast parts were previously reamed and lapped in two separate operations. Now, with a double-station Bore-Matic setup, the entire job is done in one automatic cycle — *twice as fast as before*. The work is held in collet chucks on the two boring-heads, mounted at a 5½° angle for proper taper. The tooling, adjustable for six different sizes of die castings, is mounted on the cross slide, which indexes at the end of the boring stroke to eliminate drag lines.

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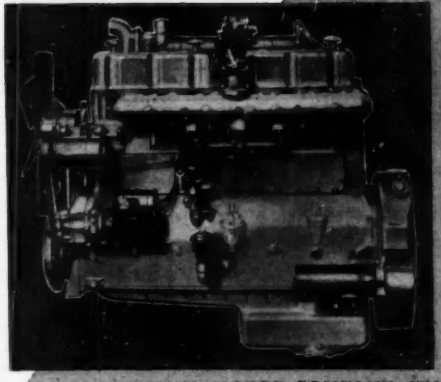
powers the pumpers!

OREN

WAUKESHA 145-GKB HIGH OUTPUT FIRE ENGINE SPECIAL
Six cylinders, 5¼-in. bore x 6-in. stroke, 779 cu. in. displ., 240 hp. at 2400 rpm.



● "The South's Only Fire Truck Manufacturer"—Oren Roanoke Corp. of Roanoke, Virginia—builds in protection and performance *with power*. Waukesha power!

This powerful pumper—an Oren Model 1600/1000—is now an important part of the fire fighting facilities of Ludlow, Mass. It's a custom-built, triple combination, 1000 gpm. @ 150 lb. pumper—completely modern from its Hale Midship Mounted Centrifugal Pumps to its Waukesha 145-GKB High Output Fire Engine Special power plant developing 240 hp. at 2400 rpm.

It's a six-cylinder, valve-in-head type engine with every wanted feature for fire engines—fully counterbalanced 3½-inch 7-bearing crankshaft • twin ignition • torsional vibration dampner • down draft carburetion • crankcase ventilation • overhead valves with Stellite seats • removable wet sleeve cylinders • aluminum pistons. And it's arranged for full electrical equipment and all modern accessories.

Send for Bulletin 1402.

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WAUKESHA ENGINES

WANTED: *A better metal for water pump shafts.*
Working conditions bad...no vacations...
hard physical labor...long hours.
THE TWIN COACH COMPANY
KENT, OHIO

"K" Monel-shafted bus water pump, manufactured by the Sherwood Brass Company of Detroit, Mich. for the Fageol Products Company, Kent, O.

Position Filled by "K" Monel*

Yes...it's a tough job, being a bus water pump shaft. Most metals don't last long at it, as any maintenance man will testify.

That was the situation at the Twin Coach Company. Water pump shafts in their buses were failing with monotonous and costly regularity. Then one day they asked the Fageol Products Company—if something couldn't be done about it.

Something could. The Fageol Products Company came through handsomely. Twin Coach's pumps are now equipped with "K"* Monel shafts...and things are looking *up* in the maintenance department.

Mr. A. G. Hilf, Vice President in charge of production at the Fageol Products Company explains it this way:

"'K' Monel was chosen for water pump shafts because:

1. *It is corrosion resistant.*
2. *It can be heat-treated to secure satisfactory hardness.*
3. *It expands only slightly during extreme variations in water temperatures.*
4. *It has high resistance to corrosive mineral salt deposits encountered in some localities.*

"This combination of desirable characteristics should result in greatly increased service life and much reduced maintenance in 'K' Monel-shafted pumps."

Because of its unusual properties, "K" Monel has an excellent service record in a wide range of industrial "task" applications. In fully age-hardened condition, "K" Monel has a minimum yield strength of 100,000 psi, and a tensile strength of over 140,000 psi. Cold-drawn, age-hardened "K" Monel has a Brinell (3000 kg) hardness of 265—320. In addition, this alloy is rustproof and resistant to most commonly-encountered corrosives. And of particular importance in vehicular applications, "K" Monel offers high resistance to fatigue failure.

For further information, ask for Bulletin T-9, *Engineering Properties of "K" Monel*. Remember, too, that our Technical Service Department is always ready to help with your specific metal-selection and fabrication problems.

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67 Wall Street, New York 5, N. Y. *Reg. U. S. Pat. Off.

Monel*

...FOR MINIMUM MAINTENANCE

EMBLEM OF SERVICE
INCO
TRADE MARK

AUTOMOTIVE INDUSTRIES

Published Semi-Monthly

August 15, 1950 Vol. 103, No. 4

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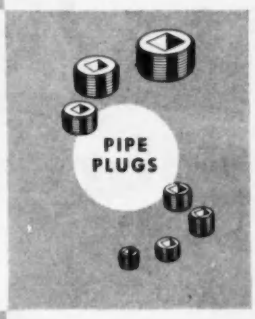

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"we like to do business with Muskegon!"

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"It is Muskegon's firmly established policy to sell exclusively to manufacturers (1) for installation as original equipment and (2) for resale for service purposes."

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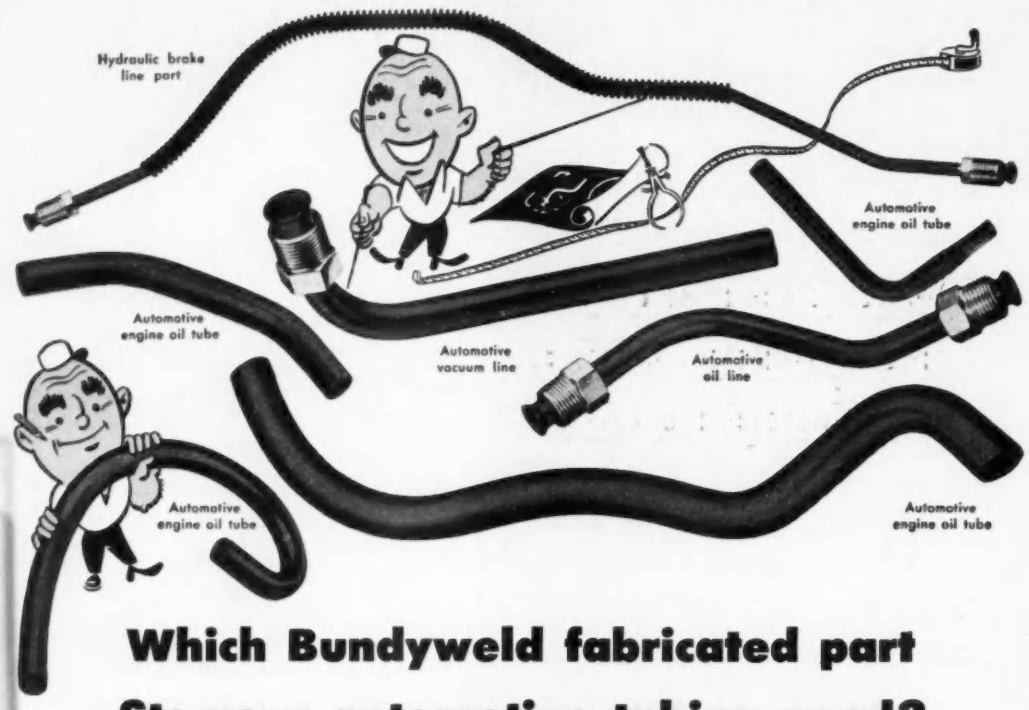
MUSKEGON, MICHIGAN
PLANTS AT MUSKEGON AND SPARTA

"THE ENGINE BUILDERS' SOURCE"



Which Bundyweld fabricated part fits your automotive tubing need?

Chances are it's among those shown above.

If not, it *could* be. For no matter how perplexing the bend or how demanding the performance, Bundy engineers, working with amazing Bundyweld, can fill *any* of your automotive tubing needs.

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No wonder "Better see Bundy" is the word for those who want better tubing, better bending. Find out all the reasons why from a distributor listed below, or write: ***Bundy Tubing Company, Detroit 14, Michigan.***

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WHY BUNDYWELD IS BETTER TUBING

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continuously rolled twice around laterally into a tube of uniform thickness, and

passed through a furnace. Bonding metal fuses with basic metal, presto—

Bundyweld . . . double-walled and brazed through 360° of wall contact.

NOTE the exclusive patented Bundyweld beveled edge, which affords a smoother joint, absence of bead and less chance for any leakage.

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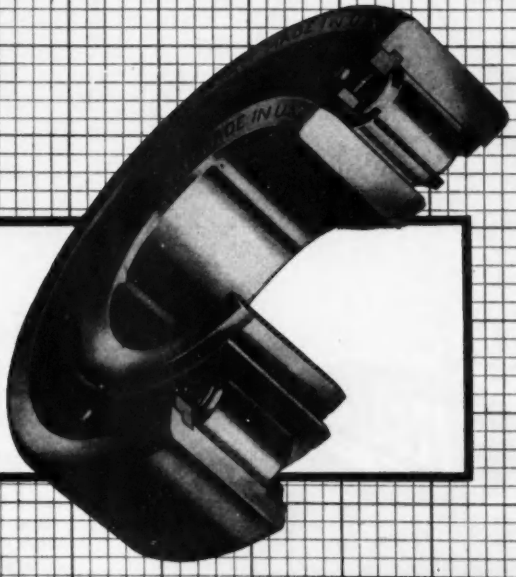

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Hyatt makes an extensive line of roller bearing types and a complete range of sizes which enable designers of cars, trucks and buses to select the correctly engineered bearing to fit the job to be done.

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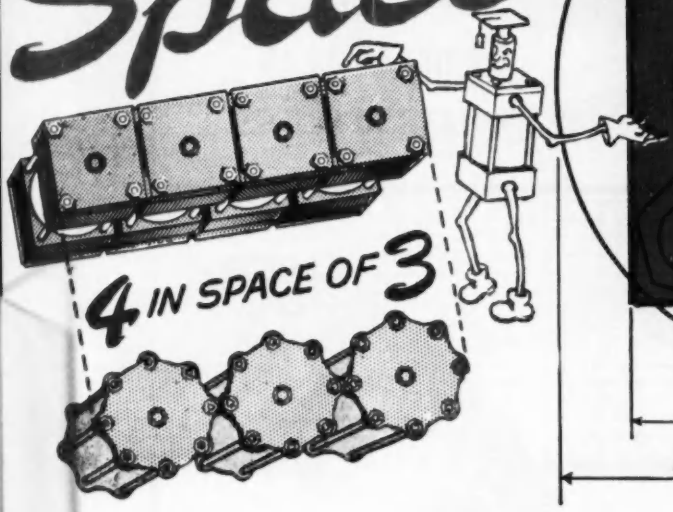
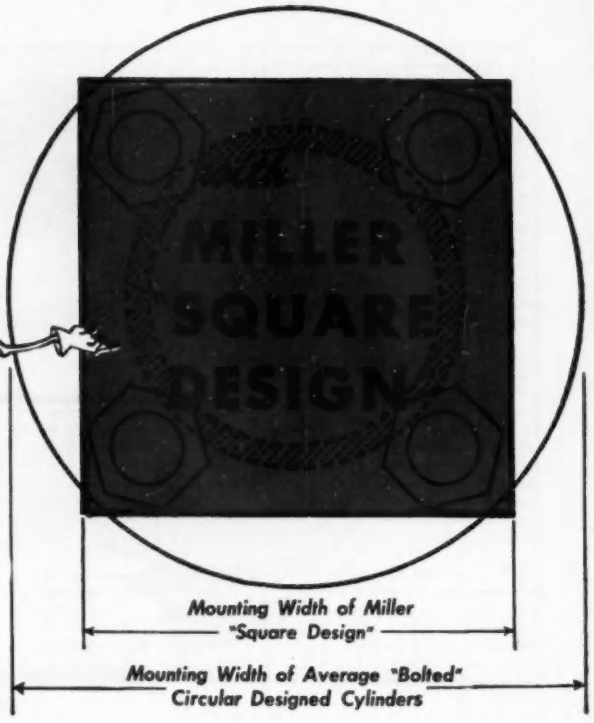
Save Space





Air *and* Hydraulic CYLINDERS...

The SQUARE DESIGN of Miller Cylinders saves up to 25% of mounting space, permitting more cylinder power in the same space and easier, more convenient installation in "tight spots." Thus, in many cases, machines and equipment can be designed more compact and less costly by using Miller Cylinders. Hours of drafting time can be saved — as only a few straight lines show any view on drawings.

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Other important *standard* features of all Miller Cylinders include: solid steel heads, caps and mountings, hard chrome plated piston rods, dirt wiper seals, and other "quality" features as shown in illustrated bulletins sent FREE on request. Remember, too, that Miller Hydraulic Cylinders (2000-3000 psi) meet the J. I. C. Hydraulic Standards.

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• Solve "Limited Space" Problems
• Simplify Designing and Installation
• Save hours of Drafting Time

Write for illustrated cylinder bulletins A-105 and H-104

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Throughout 43 years of leadership in this industry, Ross gears have been distinguished for long life, simplicity of adjustment and maintenance of long-recognized qualities of safety, stability and performance. We invite discussion of any steering problem.

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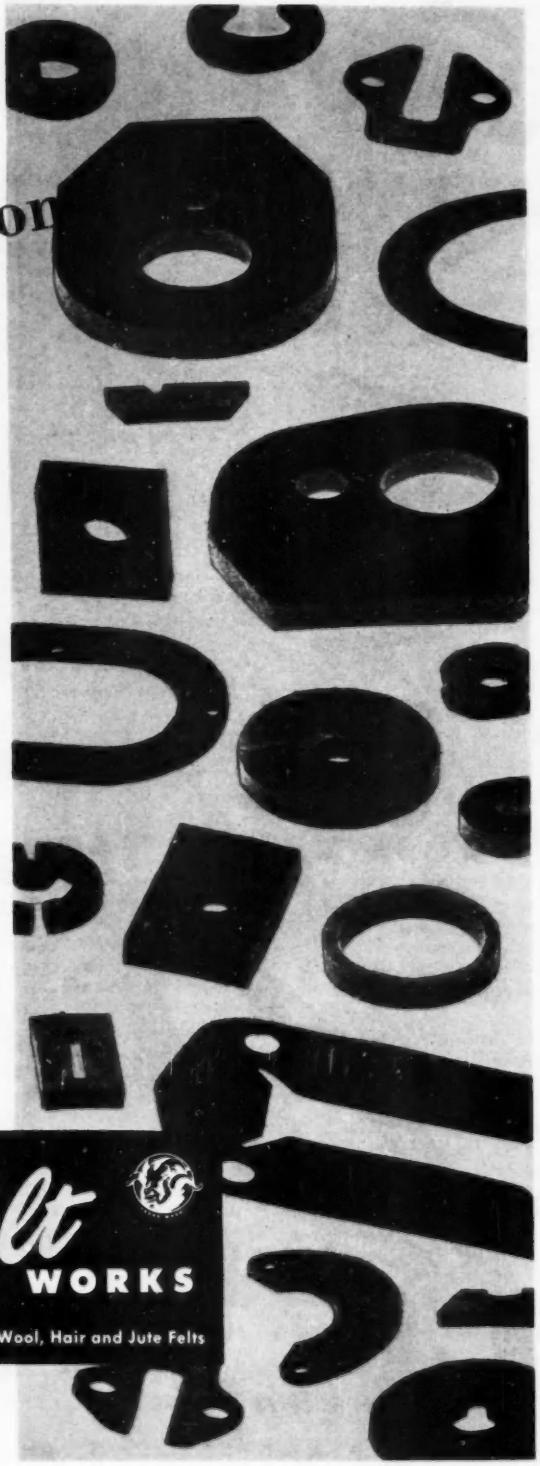

Production to close tolerances mostly applies to metal working. But the technique of Western Felt production and processing has built an enviable reputation for engineering precision.

Chemical specifications must be perfectly met – parts from wool softness to rock hardness are cut to close tolerances. As an extremely versatile material Western Felts are resilient, flexible, compressible. They resist oil, water, heat age – do not ravel, fray or lose shape. New uses found daily. It pays to depend on Western Felt.

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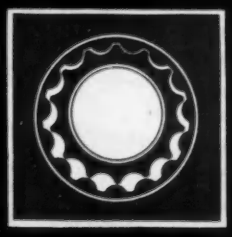

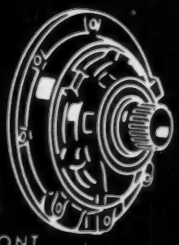

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GENERAL OFFICES: CLEVELAND, OHIO
Pump Division
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An entirely NEW the FULLER

- No gear splitting—10 selective gear ratios, evenly and progressively spaced.
- Easier, quicker shifts—28% steps—one shift lever controls all 10 forward speeds.
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- Less driver fatigue—⅓ less shifting.
- Range shifts pre-selected—automatic and synchronized.

Clyde Peters, veteran driver, drives a Roadranger-equipped White tractor for Producers Transport, Inc., Benton Harbor, Michigan . . . says "There is no other transmission like this new Roadranger."

For Heavy Engines—from 150 to 300 hp. In Fuller's 10-speed Roadranger—a completely *new* transmission—all 10 speeds are controlled by only *one* shift lever . . . gear splitting is entirely eliminated. Only one range shift need be made during the progression through the 10 forward speeds.

All gear ratios are selective . . . evenly and progressively spaced. With 28% steps the driver can shift easily and quickly . . . keep his engine turning at its most efficient speed . . . maintain higher average road speed—with less fuel consumption.

All manual shifts, up and down, are made in the conventional manner. The change from one range to the other—in either direction—is made by moving a button on the shift lever to pre-select the desired range. The synchronized range shift occurs automatically as the shift lever moves through the neutral position.

The Roadranger also features *all helical gearing* . . . high capacity with lower weight than conventional duplex transmissions. And it requires less installation space than a conventional transmission and amidship auxiliary.

FULLER MANUFACTURING COMPANY

theory in transmissions

Roadranger

One Lever Controls 10 Speeds . . . No Gear Splitting

Model R-95-C

Fuller TRANSMISSIONS

Listen to the men who know the Roadranger. Clyde Peters, Producers Transport driver, and an old hand at all kinds of trucks and buses, says:

"There is no other transmission like it. Shifts are short, fast, easy. On a 2600 rpm engine, I don't lose more than 500 rpm on a shift and I make better time."

And Clyde is right when he says "there's no other transmission like it." For the Roadranger is the *only* 10-speed transmission where *all* steps are equal, selective and progressive and where one lever controls *all 10* speeds without gear splitting.

Joe Reid, Producers Transport's operations manager, says, "This gear box really lets us use all the horsepower the engine puts out. With the Roadranger, we can keep the engine in its economy range—and eliminate all lugging. According to our figures, we'll pull *20,000 more pounds of load* than we could with a conventional transmission—and do it with about the same amount of gas as before."

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(Transmission Division) KALAMAZOO 13F, MICHIGAN

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OF BETTER
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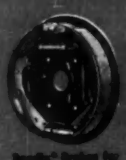

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AUTOMOTIVE INDUSTRIES
Reg. U. S. Pat. Off.

High Spots of This Issue

★ **Conversion to War Production**

THE DETROIT VIEWPOINT on this timely topic of Conversion to War Production is brought to you by Leonard Westrate, Detroit News Editor. Additionally, formidable listings of World War II equipment produced by major motor vehicle companies are published. For an informed look both back and forward in the current situation, see page 32.

★ **Producibility of Airframes**

THE AUTHORS HERE DISCUSS the three types of joints in airframe construction—manufactured joints, semi-field service joints, and field service joints—and their merits and demerits in breakdown and assembly. Helpfully illustrated and described are procedures to be preferred and to be avoided in achieving optimum producibility. Page 34.

★ **Russia's Industrial Strength—Part Two**

THIS CONCLUDING ARTICLE, on a subject brought into even sharper focused interest of late, deals with Russia's economic growth since 1940. It shows how setbacks occurring during World War II have been largely overcome, and points up the potential military challenge of Russia's economy. Page 39.

★ **Buick's Automatic Transmission—Dynaflow**

PART VIII IN AUTOMOTIVE INDUSTRIES' continuing study of the new transmissions, describes and amply diagrams the Dynaflow—first transmission using a hydro-kinetic torque converter especially designed for passenger cars. Page 42.

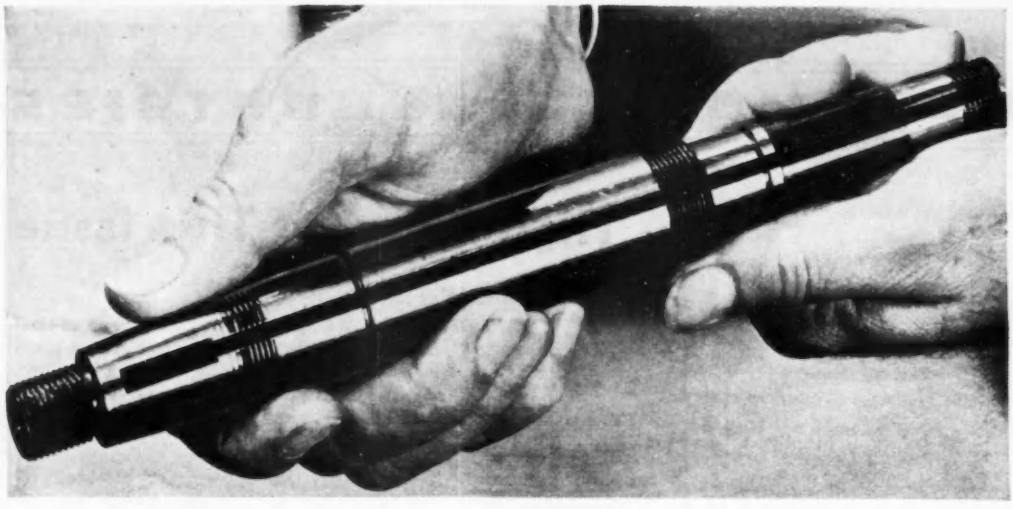
★ **Chrome Plating Stainless Steel Grilles**

THE MASS PRODUCTION SETUP recently placed in operation by Briggs Mfg. Co. is said to be one of the first examples of chrome plating of stainless steel motor car grille assemblies. Steps in producing a new brilliance with remarkable plating thinness are divulged in this interesting production story. Page 48.

★ **19 New Product Items**
And Other High Spots, Such As:

A British jeep having 80 hp engine and independent wheel suspension; a huge dynamometer for testing heavy-duty brakes acquired by Raybestos-Manhattan; and the great variety in gear production achieved by one of the gear manufacturing specialists.

News of the Automotive Industries, Page 17
For Complete Table of Contents, See Page 3



New Rycut Alloy Steel Cuts M* Costs 40%

**M stands for all machining and related costs including actual machining time, down-time necessary to re-grind tools and finishing time.*

Here's how:

1. Rycut, a medium carbon alloy, machines 25% to 50% faster than standard alloys of the same type, in either the annealed or heat treated condition.
2. Rycut generally increases tool life 100%—in some cases, as much as 300%.
3. Rycut requires less grinding after hardening due to its better machined surface finish.

These savings have been proved by the shop experience of Rycut users throughout the country as well as by carefully recorded machinability tests. Yet the initial cost of Rycut is practically the same as that of standard medium carbon alloys.

You need no special shop techniques with Rycut. It requires only conventional oil-quench and temper methods of heat treatment; also responds well to flame or induction hardening. And remember, a Ryerson Certificate of analysis and hardenability accompanies every shipment of annealed Rycut to guide its heat treatment.

This money-saving steel is available for immediate delivery—annealed or heat treated—in rounds, flats or squares, in a wide range of sizes. Just call your nearest Ryerson plant for test samples or an initial order. Write for technical bulletin explaining the advantages of Rycut.

Additional Saving—

Another important saving may be gained by concentrating a variety of steel requirements in a single order to your nearby Ryerson plant. Lower prices in the higher quantity brackets and economies in time and paper work add up to a substantial saving.

PRINCIPAL PRODUCTS

CARBON STEEL BARS—Hot rolled & cold finished
STRUCTURALS—Channels, angles, beams, etc.
PLATES—Many types including Inland 4-Way Safety Plate
SHEETS—Hot & cold rolled, many types & coatings
TUBING—Seamless & welded, mechanical & boiler tubes
ALLOYS—Hot rolled, cold finished, heat treated
STAINLESS—Allegheny bars, plates, sheets, tubes, etc.
TOOL STEEL—Oil and water hardening
REINFORCING—Bars & Accessories, spirals, wire mesh
MACHINERY & TOOLS—For metal fabrication

RYERSON STEEL

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • PHILADELPHIA • CINCINNATI • CLEVELAND
DETROIT • PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO

News of the AUTOMOTIVE INDUSTRIES

Vol. 103, No. 4 August 15, 1950

War Fails to Halt New Model Plans

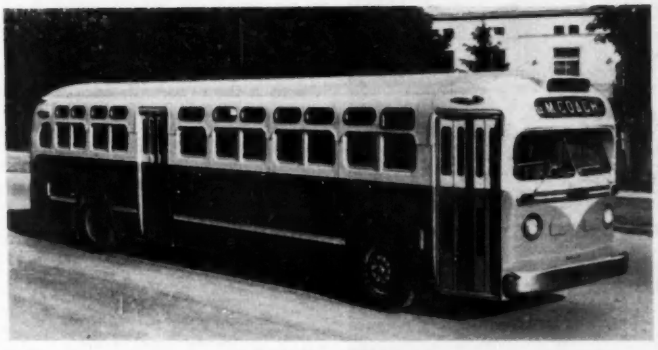
Despite the confusion of the current war situation it seems apparent that new model changes are going ahead as scheduled. Packard will announce its 1951 line this month with three other independents announcing their new models in late September or October. The Big Three are also expecting to go ahead with original plans on new models, but later, either at the end of this year or early in 1951. Actually, die work and other commitments are too far advanced at this stage to call back without the expense and confusion amounting to more than would be the case if current models were continued.

GM Second Quarter Net Sets New High in U. S.

Recording a new high in American corporation history, General Motors Corp. had a net income of $272,889,624 on net sales of $1,963,641,243 for the second quarter of 1950. For the first six months of 1950, net sales totaled $3,606,300,692 and net income was $485,277,389. This compares with net sales of $2,877,674,126, and net income of $303,678,643 for the first half last year. For the first time in GM history, unit sales of cars and trucks in a single quarter topped the million mark: the figure for the second quarter being 1,012,874 units. GM sales of 1,878,630 units for the first six months of 1950 also constituted a record.

Move to Return Standby Plants to Defense Output

Initial moves have been made toward returning some of the government's standby industrial facilities to defense production. In one action, the White House asked an appropriation of $6 million for reactivation of aluminum-making facilities. While the Munitions Board had no immediate comment, it was said that the former Alcoa primary metal plant at Riverbank, Calif., and the Alcoa alloy plant at Burlington, N. J., were the most likely to be reopened after replacement of considerable equipment.



DESIGNED FOR '51

This new General Motors 51-passenger Diesel coach, model TDH 5103, measures 40 ft in length and 8.5 ft in width. The new coach is powered by a six-cyl GM Diesel engine, developing 200 hp at 2000 rpm and maximum torque of 545 lb-ft at 1000 rpm

Nash Names Farina as Styling Consultant

Nash Motors has announced the appointment of Pinin Farina, internationally famous designer of custom bodies for automobiles, as a consultant to the company. The Farina factory is located in Turin, Italy, where he builds special bodies for Alfa Romeo, Fiat and Maserati chassis (see Oct. 1, 1947, issue of AUTOMOTIVE INDUSTRIES, page 36).

Industry Cool to Talks With Union on Steel

According to reliable reports the proposal by Walter Reuther, UAW-CIO president, that automobile industry and labor representatives meet to consider problems arising from the Korean war situation is getting a very cool reception. The principle object of such a meeting would be to discuss ways of increasing steel production substantially for not only the war effort, but for future peacetime needs. It is understood that two principal methods would be proposed: one, that the industry as the largest single customer of the steel industry bring pressure for greater expansion of facilities and, two, that in the event steel companies did not voluntarily agree to such a program the government be urged to construct supplementary capacity to augment existing steel facilities. It is understood that only one company agreed to the Reuther proposal, that one declined outright, and that the rest were noncommital, at least for the time being. The letter proposing the joint meeting was sent to all automobile manufacturers and to the National Automotive Parts Manufacturing Association.

Chrysler to Double Nine Mile Road Press Plant

The Chrysler Corp. is planning an addition to its Nine Mile press plant, Detroit, which will just about double the floor space. A 320-ft by 1260-ft structure will be added to the original plant, which now comprises about 415,000 sq ft.

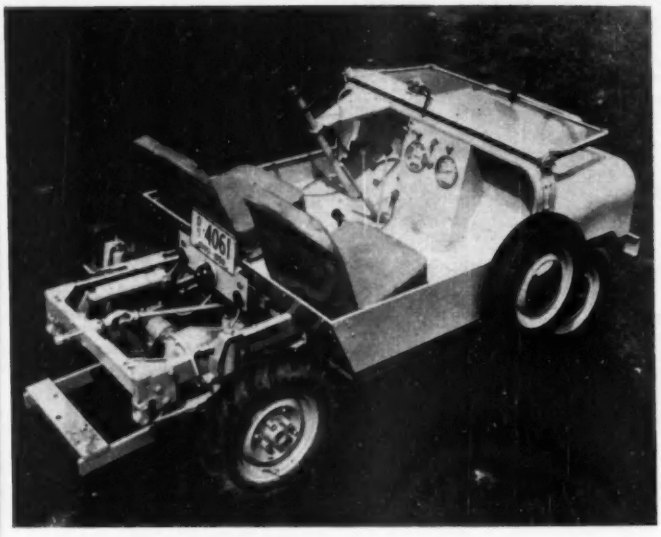
Lincoln-Mercury Building New Assembly Plant

The Lincoln-Mercury Div. of Ford Motor Co. will soon start construction of a large new assembly plant near Wayne, Mich., a few miles west of Detroit. All Lincoln assembly operations now being performed at the Lincoln plant in Detroit and on the Mercury assembly line at the Rouge plant at Dearborn will be housed in the new unit which will have a capacity of 640 cars a day on a two-shift basis. The current Mercury line at the Rouge plant will be used for production of Ford cars and possibly trucks. The new

assembly plant, on a 179-acre site will have more than one million sq ft of floor space and will be the fourth to be built within three years by the Lincoln-Mercury Div. The present Lincoln plant may be used for manufacturing or may be sold.

U. S. Factory Vehicle Sales Set Record in June

A new monthly record was set during June when U. S. factory sales totaled 856,626 motor vehicles, according to the Automobile Manufacturers Association.



CROSLEY FOR THE COUNTRY

This new 26.5-hp Crosley FarmOroad is a dual-purpose farm and road vehicle said to combine the work performance of a tractor and utility of an automobile or light truck. With a factory list price of about $800, the unit has a 63-in. wheelbase and is 45 in. high. This cut shows heavy rear end, hydraulic lift and power take-off for operating plows, harrows, cultivators and other implements. Front power take-off and hydraulic lift are also available, and dual rear wheels may be mounted for heavy pulling.

During June 720,688 passenger cars, 135,332 trucks and 606 buses were turned out. For the first six months of this year, the industry has produced 3,750,321 motor vehicles.

An all-time production high was also set in June by Chrysler Div., Chrysler Corp., according to Joseph O'Malley, general sales manager.

June New Car Registrations Certain to Set Record

Plans of the industry to reach a near record high production this month indicate that the manufacturers are not looking for any immediate curtailment of output. It is estimated that if schedules are met, U. S. plants this month will turn out about 840,000 vehicles consisting of approximately 710,000 passenger cars and 130,000 trucks. The big question mark in whether or not that total will be reached is the availability of steel which has become increasingly tight in the last few weeks. Production during July was down from the all-time record of more than 850,000 units built in June, principally because of the long holiday weekend the early part of the month. This month Packard is back in production, Kaiser-Frazer is also stepping up its output rapidly, and all other companies are pushing at top speed.

Meanwhile, new car registrations continue at a high level with preliminary estimates for June indicating the highest monthly total on record with more than 600,000 projected. If that figure is attained, the June record will be more than one-third higher than for any other month in history. The previous high month was May, 1941, with 514,748 new cars registered. Truck registrations also turned upward in June being estimated at approximately 95,000 units, about 5000 higher than for May.

GM's Chevrolet Motor Div. scored its second highest production month in history in July: 131,426 passenger cars and 41,585 trucks were built in U. S. plants for a monthly total of 173,011. In seven months of 1950, more Mercury automobiles were produced than in any similar period in the car's history. Total production through July was 192,841 units as compared to 203,339 for the entire year of 1949, the best previous year. GM produced 326,907 passenger cars and trucks in the United States and Canada during July: 273,567 were passenger cars and 53,340 were trucks. For the year to date, GM has produced 2,210,809 cars and trucks in the United States and Canada compared with 1,617,701 for the same period last year.

Aircraft Procurement May Total $10 Billion

A breakdown of aircraft procurement funds in the President's emergency request for $10 billion includes $2,777,300,000 for the Air Force and $646,269,000 for Navy air. These new requests, if added to the 1951 appropriation requests still pending in the Senate, increase the total obligational authority for aircraft procurement to $5,722,100,000, or $4,342,300,000 for the Air Force and $1,379,800,000 for the Navy.

Armed Forces Announce More Contracts

The Army has announced that it has awarded the following contracts: Jubilee Mfg. Co., Omaha, Neb., automotive spare parts, $117,474; Standard Prod. Co., Cleveland, O., hatch, hood, driver's hatch assy., $134,460; GMC, Truck & Coach Div., Pontiac, Mich., automotive spare parts, $196,856; GMC, United Motors Serv. Div., Detroit, Mich., bearings, $187,154; Saginaw Products Corp., Saginaw, Mich., snow trailer, one-ton, $317,785; International Harvester Co., truck-chassis, five-ton, $368,225; The Corbitt Co., Henderson, N. C., truck-chassis, six-ton, $1,016,724; and Winter Weiss Co., Denver, Colo., kit, conversion for truck, tractor, six-ton, $101,355.

An Air Force contract has been signed for a substantial additional number of Fairchild C-119 Packets, twin engine troop and cargo transport planes. Lear, Inc., discloses the receipt of Air Force contracts in excess of $3,300,000 for Lear Automatic Pilots and Gyro Instruments, and a substantial new production order for Martin P5M-1 Marlin anti-submarine flying

GET ABOUT IN THE SPORTABOUT

Now in production, the new Dodge Sportabout, an improved version of the Wayfarer Sports Roadster, has an aluminum frame top of weatherproof fabric which can be raised or lowered in a few seconds, and is powered by a 103-hp engine. Factory retail price at factory, Detroit, Mich., is $1635, not including federal or local taxes.

boats has been placed by the U. S. Navy with the Glenn L. Martin Co. A $4 million order for Cyclone 9 engines for the Navy R4D transport planes has been placed with the Wright Aeronautical Corp. Northrop Aircraft, Inc., Hawthorne, Calif., has received a letter of intent from the U. S. Air Force ordering a considerably increased quantity of Scorpion F-89 all-weather interceptors.

The Boeing Airplane Co. has received letters of intent from the U. S. Air Force authorizing start of work on "substantial additional quantities" of Boeing military aircraft at both the Kansas and the Washington plants of the company. Stepped-up production of Lockheed Aircraft Corp.'s jet fighter production is beginning immediately following a letter of contract from the Air Force, followed by another letter of intent from the Navy. Douglas Aircraft Co., Inc., received a modernization order from the Bureau of Aeronautics for 100 R4D transports to be converted to Douglas Super DC-3's.

Chrysler Develops New Electric Window Lift

Chrysler has developed and is now in production on a new electric window lift being used initially on the Chrysler Imperial four-door sedan. Basic components are a small reversing motor, screw and nut drive, bell crank, combination relay-circuit breaker unit, and operating switch. With an individual motor for each window, the unit functions as an independent self-contained unit.

Dow Chemical Dedicates New $8 Million Power Plant

The Dow Chemical Co. recently dedicated a new $8 million power plant facility at Midland, Mich. At present one turbine and two boilers are operating in the 35,000 sq ft building, but space remains for two more boilers, one turbine and their respective auxiliaries. Designed and supervised by Dow engineers, the power plant was built by the Austin Co. of Cleveland, O., and is situated in the south central portion of the Midland plant.

Ford Elects Five New Directors

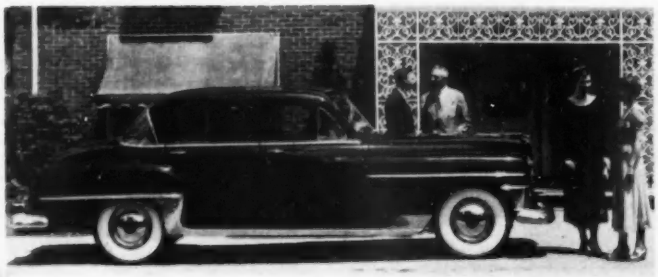
The Ford Motor Co. recently announced the election of five vice-presidents to directors of the company. They are John S. Bugas, vice-president—industrial relations; L. D. Crusoe, vice-president and general manager of the Ford Div.; D. S. Harder, vice-president—manufacturing; Harold T. Youngren, vice-president—engineering, and Theodore O. Yntema, vice-president—finance.

Improvements in Continental Gasoline Engine

Recent design improvements and changes in the well-known Continental T-6427 gasoline engine have combined to effect a marked increase in output, better performance, and extended service life. Major specifications and external appearance of the engine, however, remain the same. However, taking into account the changes to be mentioned below as well as an increase in compression ratio from 5.85 to 6.4 to 1, the revised version is capable of operating at higher speeds and will deliver 163 bhp (max.) at a governed speed of 2800 rpm. Too, maximum torque is now 342 lb-ft at 1400 rpm. These are gross output figures taken from the power curves. Coming to the new features of design, it is of interest that Continental has adopted positive exhaust valve rotation as standard equipment. In addition, exhaust valves are of larger diameter, sodium-cooled and Stellite-faced. Automatic heat control also has been added. Another item of importance

TONED TWICE!

A new two-tone sports sedan, the Crestliner, shown above, is the latest model in the Ford line. Its styling includes black vinyl covering the steel top and new airfoil paint panels on either side. The model has an all-steel body and is equipped with custom items.



LONG AND LOW

Chrysler has added this new six-passenger Imperial Sedan to its line. With a wheelbase of 131½ in., the new model is powered by the 135-hp Chrysler engine, and is equipped with Prestomatic Fluid Drive

is use of a high output camshaft for the revised model. Two optional features supplement the new design elements noted above. One is the availability of duplex downdraft carburetion; the other is a chromium-plated top ring. Both will be supplied when specified, at extra cost.

Chrysler Reveals Increase in Excise Tax Bite

The Chrysler Corp. has come up with some interesting figures showing the effect of tax levies on its own operations. During June, Chrysler paid $16 million to the government for excise tax payments, the largest single monthly payment in Chrysler's history. The payment also exceeded the company's entire excise tax bill during the entire year of 1938 or 1939 and was more than half of that paid in the prewar record year of 1941. During the 1939-1941 period, the company paid $151 million in taxes when production was 2,851,000 vehicles. During the three postwar years, 1947-1949, with only 13 per cent more vehicles produced, total taxes were three times as much, or $536 million. During the last decade, Chrysler paid more than $870 million in taxes as compared with a net profit during the period of $494,479,000. Chrysler estimates that it costs the company approximately half a million dollars a year to keep tax records and make out tax forms.

Waukesha Has New Line of Engines

The Waukesha Motor Co. in announcing a new line of industrial engines introduces a series of portable power units built around three basic sizes, a four-cyl and two six-cyl engines. These three basic sizes are made as Diesels, gasoline, butane or natural gas engines, and carry approximately the same output ratings, size for size, whether Diesel, or carbureted fuels are employed.

of the Kaiser Traveler utility model is slated for production in September. The new schedule includes the Henry J, now starting in production, and will also see an acceleration of the two-door Kaiser which went into production this month.

GM Faces Wage Hike Under Cost of Living Contract

GM will be faced with an hourly wage increase of at least four, and possibly five cents an hour under its cost-of-living contract starting Sept. 1. At any rate, the increase will add considerably to the company's labor costs which were increased between 15 cents and 16 cents an hour when the new contract was signed May 29. The newest wage increase will undoubtedly spell trouble for Ford and Chrysler when contracts are reopened for negotiations early next year. In fact, the announcement of an expected GM raise is believed to have been instrumental in the defeat by Hudson workers on a contract very similar to that granted by GM so far as benefits are concerned, but without the escalator clause. The higher wage costs, together with the increased cost of other items going into automobile production, bolsters still further a growing belief that prices of cars and trucks may again be raised before the end of this year.

SIX TO THREE

Recently added to the Chrysler line, the Traveler has a fold-down rear seat which converts the model from a six-passenger sedan to a three-passenger sports car or utility vehicle with cargo area, with additional cargo space provided by a luggage rack mounted on roof. The car has a wheelbase of 125½ in., and is powered by a 116-hp engine.

K-P Boosting Output By 50 Per Cent

The Kaiser-Frazer Corp. is scheduling a 50 per cent hike in output in early August with current output of over 800 cars a day being boosted to 1200 units daily by the addition of a second shift. June production of 17,874 units was the highest in the year, and the August production schedule calls for 22,000 units, and this too will be substantially increased each month, reaching a 360,000 unit per year rate by January, 1951. In addition to current models and the Henry J, August will mark the debut of two more 1951 Kaiser body styles, the club and business coupes, while the two-door version

Dow Chemical Developing Magnesium Die Castings

Although magnesium applications in motor cars have been discussed for some years, it is only recently that real

headway has been gained in developing production applications based strictly upon engineering economy. Dow Chemical Co. now has embarked upon a large scale activity in the automotive industries in exploiting magnesium die castings. Magnesium die castings are intended exclusively for unplated interior parts. The area of useful applications appears to be quite large, although at the present moment early applications have been designed for such parts as rocker arm support brackets for overhead valve engines; covers of all types and sizes; steering column brackets; windshield wiper motor end bell; and generator end plate.

The rocker arm support bracket is of particular interest since in this case advantage is taken of its high expansion coefficient to counteract the effect of expansion of metallic parts. By proper proportioning of metal in the bracket, it is feasible to maintain a practicaly constant clearance in the valve train regardless of temperature variations. It is also considered practical to use magnesium die castings for the valve bodies and control valve elements now being introduced in automatic transmissions. From the standpoint of cost saving, magnesium die castings are said to give most favorable results when used in parts having appreciable weight and produced in large quantity. Of interest to engine designers in particular is a complete oil pump package developed recently. Housing as well as the generator gears are of magnesium.

Ford Starts New Program to Develop Executives

The Ford Motor Co. is taking another forward step in its program for developing management personnel within its own ranks. Following the war, with the reorganization of the company under Henry Ford II, a large part of the current top management team was recruited from other companies, a good share coming from GM. However, under a new program, the company plans to draw its supply of future managerial talent from among current personnel, a practice considered highly desirable for the most successful operation. The three-point program aims to help management personnel attain maximum effectiveness in present positions; to develop qualified men for management positions in order to have available an adequate reserve of management personnel; and to make the best possible use of each member of the management team in terms of his ability, qualifications and potential.

Thompson Products Buys Assets of Ramsey Corp.

Thompson Products, Inc., has announced the outright purchase of the assets of the Ramsey Corp., piston ring manufacturer, from a foundation organized for the benefit of New York University. J. H. Coolidge, vice president and treasurer of Thompson Products, has been elected president of the new subsidiary.

Nash Nine Months Income Hits Record

The Nash-Kelvinator Corp. set new records for sales and earnings in the quarter and in the nine months ended June 30, 1950. Net earnings for the June quarter amounted to $10,052,117 while net earnings in the like period last year were $7,254,248. Sales for the June quarter this year were $132,829,364 compared with $99,717,073 last year. Net earnings for the nine months ended June 30, 1950, were $21,482,366 against $20,250,063 in the corresponding 1949 period. Nine months' sales this year were $320,752,854 compared with $280,238,699.

Willys Nets $1.1 Million in Third Quarter

Willys-Overland Motors, Inc., has reported record earnings of $1,140,576 for the third quarter of its fiscal year ended June 30. The net profit for the nine months stands at $232,269, the company declares, as against a loss of $908,307 reported at the end of the six-month period. During the quarter all major body stamping production was transferred to the modern stamping plant at Toledo, O.

Chrysler Gives Pensions to Non-Union Employes

Going into effect on Aug. 1st, monthly pensions of $100 at 65 years of age have been granted by the Chrysler Corp. to its 16,000 non-union white collar workers, the same plan granted to the UAW-CIO last spring. Chrysler has also announced jointly with the UAW that the pension arrangement agreed to by Chrysler and the UAW-CIO on May 4, 1950, has been approved by the Commissioner of Internal Revenue.

Henry Named Assistant to G.M.R. Lab Head

Donald J. Henry has been named assistant head of the metallurgy department of GM Research Laboratories. As part of an expansion in the metallurgical field, he will become assistant to A. L. Boegehold, department head.

CONVERTS IN THREE

This new Ford Country Squire station wagon can be converted from an eight-passenger model to a one-level-floor cargo wagon in three minutes. By removing the rear seat and folding down the middle seat, a level floor surface of 38.8 sq ft is created. The new wagon has a depth of more than nine ft.

News of the AUTOMOTIVE

MODEL FOR THE MILKMAN

International Harvester Co.'s new model LB-140 milk delivery truck, shown here, is equipped with a new torque converter (described on page 42, July 15th AUTOMOTIVE INDUSTRIES. This model is powered by International's Silver Diamond 240 engine, has a 109-in wheelbase and a GVW rating of 9000 lb.

Ford Adopts New Parts Sales Program Called FoMoCo

Called FoMoCo, a new packaging and merchandising program for parts and accessories of the Ford Motor Co. is being introduced to approximately 6500 Ford dealers throughout the United States. FoMoCo is the new trademark for all genuine Ford parts and accessories and will be carried on all parts and accessories packaging.

Chrysler in Production on New Hand Brake

The Chrysler Corp. has just started production of a new type of emergency brake for all its passenger lines. The unit is an internal expanding type brake mounted at the rear of the transmission. The new brake is sealed against water and dirt and is said to have considerably greater holding power than the type previously used while at the same time requiring much less pull on the brake handle.

Clyde Paton Named Head of Willys Engineering

The appointment of Clyde R. Paton as director of engineering for Willys-Overland Motors strengthens reports that Willys will soon be back in the passenger car business. Mr. Paton is widely known for his passenger car engineering development work with Packard, Studebaker, GM and Ford. Reports in trade circles have stated that Willys will have a small passenger car early next year.

Dana Corp. Div. Quits Because of Strike

After a two months' strike ending in a stalemate, Auburn Clutch Div., Dana Corp., Auburn, Ind., announced that it would go out of business. The company said that all efforts to settle the strike had failed and that it was closing out its operations at the end of July.

Ford's Total Assets Reached New High in 1949

With the filing of the Ford Motor Co.'s annual report with the Massachusetts State Tax Commissioner in Boston, the annual glimpse into the company's financial status reveals that a new all-time company high for total assets was reached at Dec. 31, 1949: $1,343,349,000 which is a boost of over $194,109,000 from Dec. 31, 1948.

Tooling Cost Absorption Puts Packard in Red

As a result of immediate absorption of new model tooling costs and additional tooling and manufacturing charges on Ultramatic drive, Packard has reported a loss of $736,682 for the first half of 1950. The loss is estimated after tax carry back allowances. For the same period of 1949, Packard had a profit of nearly $4.8 million. The stockholders report pointed out that the 1951 model cars scheduled for announcement late this month will be equipped more than 90 per cent with Ultramatic drive.

Ford Modernizing Steel Operations at Rouge

Expected to be completed by 1952, a long-range program of modernization and rehabilitation of Ford Motor Co.'s pressed steel operations in the Rouge plant has been disclosed. Included among major improvements are the installation of a considerable amount of new equipment, rearrangement of present equipment and facilities, and construction of two large inter-floor ramps designed to speed the flow of materials.

1950 MOTOR VEHICLE FACTORY SALES FROM U. S. PLANTS*

	Passenger Cars	Trucks	Buses	Totals 1950	Totals 1949
January	467,824	93,323	219	561,366	431,276
February	385,381	89,971	133	475,485	426,665
March	469,618	110,843	199	580,660	518,118
April	455,193	103,850	268	559,311	543,118
May	575,518	120,963	412	696,893	481,467
June	720,688	135,332	606	856,626	593,640
Total Six Months	3,084,202	654,282	1,837	3,750,321	2,994,294

*1950 Truck Factory Sales by G.V.W. for Domestic Use**

	5,000 lb. & Less	5,001-10,000	10,001-14,000	14,001-16,000	16,001-19,500	19,501-26,000	Over 26,000	Total
January	39,252	19,251	6,804	13,093	2,880	1,616	1,482	84,378
February	39,629	17,151	6,032	11,738	2,720	2,157	1,511	80,939
March	47,828	20,921	7,200	14,644	3,680	3,474	2,082	99,809
April	46,375	19,025	5,884	12,971	3,391	3,322	2,326	93,294
May	52,805	21,935	7,466	16,721	4,077	3,598	2,393	108,997
June	56,892	24,249	8,158	18,488	4,104	3,507	2,838	120,236
Total 6 Mos. 1950	284,781	122,532	41,546	87,656	20,852	17,674	12,612	587,653
Total 6 Mos. 1949	222,514	147,893	42,569	89,445	15,596	10,535	7,695	536,247

* Automotive Manufacturers Association.

INDUSTRIES

Chrysler Nets $39.5 million in First Six Months of 1950

Noting that the 99-day strike had adversely affected sales and earnings, the Chrysler Corp. reported net earnings for the first six months of 1950 of $39,543,119, and sales of cars, trucks, parts, accessories and other products of $675,385,143. Unit sales from United States plants for the first six months were 399,380 passenger cars and trucks.

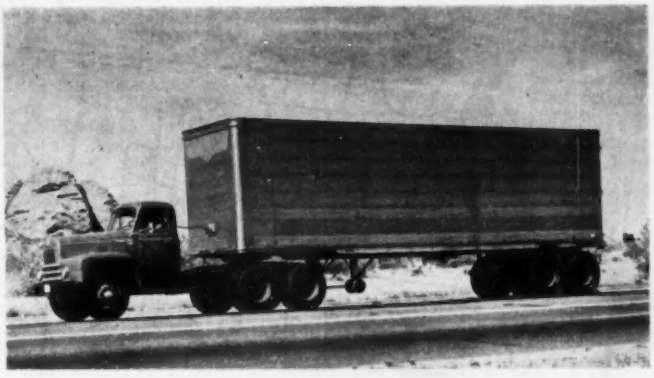
The financial results for the first six months of 1950 compare with net earnings of $53,222,843 and net sales of $950,927,855 for the first six months of 1949.

Studebaker Stops Building New Plant

Because of doubts regarding the availability of essential building materials, the Studebaker Corp. has temporarily halted the construction of its $5.5 million passenger car assembly plant at North Brunswick Township, N. J.

Twin Coach Sells 500 Propane Buses

An order for 500 51-passenger propane-fueled buses was awarded to the Twin Coach Co., Kent, O., by the Chicago Transit Authority. The price of each bus was $16,235 for a total value of $8,117,500. This is believed to be the largest bus order ever placed by a transit system.



ONE OF A DOZEN

Designated as LF-195, this tractor is one of 12 new six-wheel truck models introduced by the motor truck division of International Harvester Co. The new Internationals feature a new third differential mounted on the forward tandem axle and new valve-in-head engines. The LF-195 has a GCW rating of 55,000 lb, and is powered by the Super Red Diamond 406, which develops 154 maximum bhp at 3200 rpm.

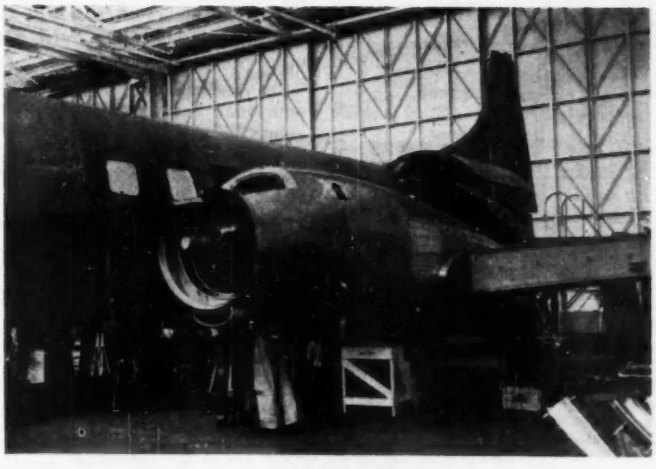
Rubber Consumption Hit High in June

Estimated consumption of new rubber during June, 1950, reached a new monthly record of 110,792 long tons according to the Rubber Manufacturers Association. The June total compares with 110,010 long tons used in May, 1950, which was itself a record total and with 84,328 long tons used in June, 1949.

Canada's Aircraft Industry Ready for Conversion

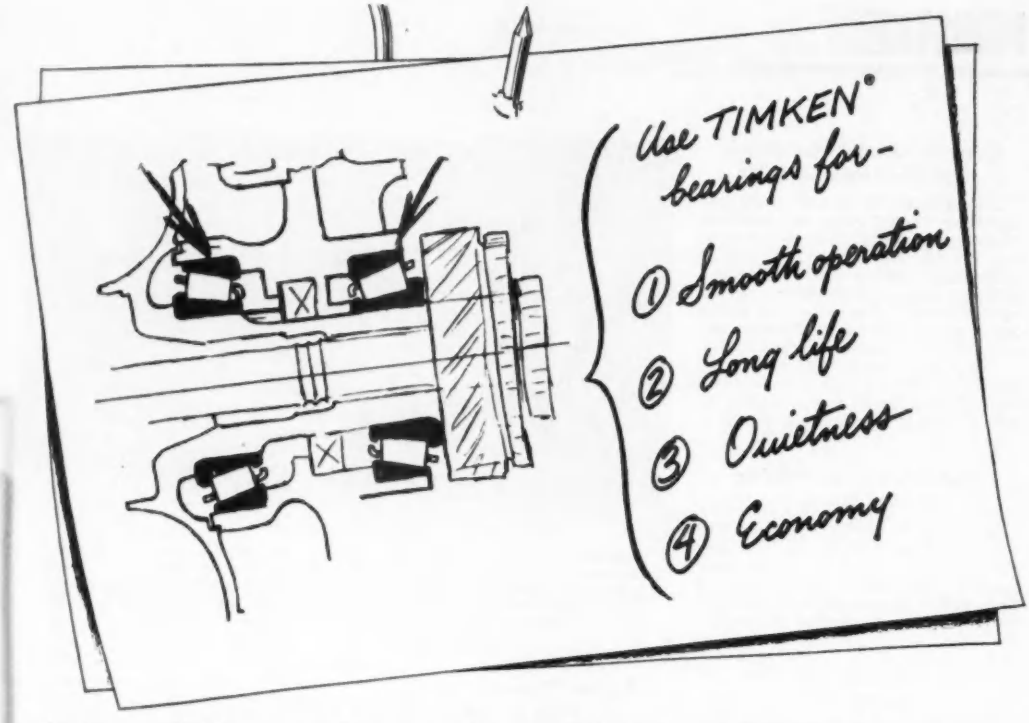
Canada's aircraft industry, a slim shadow of its wartime self, is equipped for rapid conversion to heavy production. Assembly-line potential was made known in a survey covering four principal manufacturers. Three firms have contracts totaling 147 airplanes. Of these, 100 are short-range jet fighters and 37 are elementary trainers. Only other military orders are for modification, or overhaul of craft already in service. Pending official notification to accelerate production, Canadian plane builders began gaging plant capacity with a view to boosting output. Doubling the present rate, they agreed, would be a comparatively simple matter.

Company officials presented this picture: Avro Canada, Ltd., Malton: an initial RCAF order for 10 Canadian-designed CF-100 fighters is in advanced assembly stages. Two planes are already being flight-tested. Equipment is being installed to mass-produce the powerful Orenda jet engine. Canadair, Ltd., Montreal: within 10 days the first Canadian-made Sabre interceptor will be in the air. A Defense department contract calls for delivery of 100 Sabres over the next two years. De Havilland Aircraft, Downsview: delivery will soon begin of 37 Chipmunk elementary trainers which the RCAF will transfer on long-term loan to civilian flying schools.



TWO SCOOPS

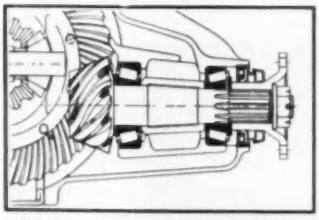
A mockup Allison 501 (T-38) turboprop engine is shown installed in the Convair-Turboliner now being built at Consolidated Vultee's San Diego plant for GM's Allison Div. The lower scoop is for the oil cooler, and the upper scoop is the air intake.



One idea gives four big advantages to your new transmissions

IF you're working on designs for a secret new transmission, you can give it a big head start toward success with one simple step—specify Timken® tapered roller bearings.

Timken bearings offer four main advantages: (1) *Smooth operation*—the true rolling motion and remarkably smooth surfaces of Timken bearings cut friction to a minimum. (2) *Quietness*—Timken bearings hold shafts in rigid alignment under the heaviest loads, eliminate end-play, keep gears meshing smoothly. (3) *Long life*—Timken bearings reduce wear on adjacent parts, assure long-term precision movement, regardless of the power conversion system used. (4) *Economy*—The tapered design of Timken bearings takes radial, thrust and combination loads, makes separate thrust bearings or washers unnecessary, saves space, simplifies design.



All but two cars use Timken bearings on the pinion. Here's a typical application.

You'll find plenty of proof of these Timken bearing advantages in the automotive field. On pinions—the industry's toughest bearing job—Timken bearings are used by all but two makes of cars! Wheels, steering parts and differentials are other typical applications.

For qualified engineering help with your bearing problems, just give us a call. In Detroit, phone TRinity 5-1380. The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".

NOTE TO P. A.'s. *Because every step of the manufacture of Timken bearings is controlled within our company... because our vast manufacturing facilities are widely dispersed . . . you will find The Timken Roller Bearing Company a supply source of outstanding reliability.*

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

NOT JUST A BALL ○ NOT JUST A ROLLER ⊂⊃ THE TIMKEN TAPERED ROLLER ⊂⊃ BEARING TAKES RADIAL AND THRUST →|← LOADS OR ANY COMBINATION

Men in the News

Current Personnel Appointments and Changes at Plants of Automotive Manufacturers and Their Suppliers.

Westinghouse Electric Corp.—Announcement has been made of the retirement of **Dr. Trygve D. Yensen**, Manager of the Magnetics Dept. of the Westinghouse Research Laboratories. **George H. McBride** has been made manager of the company's Gearing Div.

CALENDAR

OF COMING SHOWS AND MEETINGS

Conventions and Meetings

American Chemical Society, Chicago Sept. 3-8
SAE Tractor Mtg., Milwaukee.....Sept. 11
Veteran Motor Car Club 1950 Glidden Tour .....Sept. 10-15
Nat'l Assoc. Motor Bus Operators Annual Mtg., Chicago .....Sept. 13-15
Instrument Soc. of Amer. Conf. & Exhibit, Buffalo .....Sept. 18-22
British Truck Show, London....Sept. 22-30
Assoc. of Advertisers Annual Mtg., Chicago .....Sept. 25-27
Nat'l Metal Trades Assoc., New York City .....Sept. 27-29
Paris Automotive Show, Paris . Oct. 5-15
Industrial Pkging. & Materials Handling Expos., Phila .....Oct. 10-12
SAE Nat'l Transportation Mtg., New York City .....Oct. 16-18
Nat'l Safety Congress, Chicago. Oct. 16-20
Society of the Plastics Industry Nat'l Conference, Swampscott, Mass. Oct. 18-20
British Passenger Car Show, London, Oct. 18-28
Amer. Society for Metals' Annual Nat'l Metal Congress & Exhibition, Chicago ..... Oct. 23-27
Amer. Welding Soc. Annual Mtg., Chicago .....Oct. 23-27
Nat'l Lub. Grease Inst., Chicago, Oct. 30-Nov. 1
Amer. Soc. Body Engrs. Technical Convention, Detroit ..... Nov. 1-3
American Petroleum Institute Annual Mtg., Los Angeles ..... Nov. 13-16
1st Annual "Motorama," Los Angeles .....Nov. 16-19
Power & Mech. Engineering Exposition, New York City . . Nov. 27-Dec. 2
Nat'l Assoc. Engine & Boat Mfrs. Nat'l Motor Boat Show, New Your City. ..... Jan. 12-20
Plant Maint. Show & Conf., Cleveland .....Jan. 15-18
Soc. of Plastic Engrs., New York City Jan. 18-20
4th Annual Hot Rod and Motor Sports Show, Los Angeles ..Jan. 25-28
Amer. Soc. Tool Engrs., New York City .....Mar. 17
Pacific Automotive Show, Seattle Mar. 21-24
International Auto Salon, Geneva March 8-18
Amer. Mgt. Assoc., Nat'l Packaging Expos., Atlantic City .....Apr. 17-20
Nat'l Air Races, Cleveland Airport May 19-20

John F. Myers has been elected President of the Westinghouse Electric Supply Co., succeeding **David M. Salisbury**.

Norton Company—**Albert G. Belden** has retired as Manager of Research and Engineering of the Grinding Machine Div. **Walter G. Johnson** succeeds him as Manager of Research and Engineering and **Everett M. Hicks** has been appointed Manager of the Grinding Division of the company.

E. F. Houghton & Co.—**D. J. Richards**, Vice-President-Sales, has been placed in charge of all domestic and foreign activities. He will also act as Director of Advertising, and supervise activities of the Product Development and Sales Development Dept. **D. C. Miner**, Advertising Manager, and **William K. Barclay, Jr.**, have been named directors. **John F. Maisch** has been appointed controller.

General Motors Corp.—**Lewis B. Case** has retired from the Industrial Hygiene Dept. of the Research Laboratories. **M. E. Fields** has been appointed Director of Personnel and Public Relations of the Cadillac Division. **M. D. Madora** has been made Asst. Manager of the Chevrolet Commercial Car and Truck Dept.

Willys-Overland Motors, Inc.—**Clyde R. Paton** has been appointed Director of Engineering.

Chrysler Corp.—**Walter J. Simons** has been appointed to the newly created position of Director of Pensions and Group Insurance.

Ford Motor Co.—The retirement of **William W. Dulmage**, Power Consultant for the company, has been announced.

Lincoln-Mercury Div., Ford Motor Co.—**Robert W. Chambers** has been appointed Manager of Marketing Research.

The Lincoln Electric Co.—The appointment of **A. W. Sawyer**, as Asst. to the Vice-President, has been announced.

United States Steel Corp.—The following elections to offices in the National Tube Co., U. S. Steel Subsidiary, have been announced: **Wm. F. O'Connor**, Executive Vice-President; **H. J. Wallace** as Vice-President in Charge of Sales, succeeding Mr. O'Connor in that position.

Republic Aviation Corp.—Two new Vice-Presidents have been elected. They are, **T. A. Murphy** and **Henry Lehne**.

Collins & Aikman Corp.—The election of **P. B. Baldwin** as Vice-President, has been announced.

The Trailmobile Co.—**W. A. Burns, Jr.**, has been appointed Vice-President and Sales Manager. **Harold S. Hoover** has been named Director of Public Relations.

Fruehauf Trailer Co.—**Herbert C. Darroch** has been made Vice-President and General Manager of the Fruehauf Trailer Co. of Canada, Ltd.

General Controls—**Wm. C. Stringfellow** has been assigned to the staff of Sales Engineers of the Dallas branch; **Hamilton G. Sudler** has joined the Sales Engineers in the New York office and **E. F. Bruegel** has been assigned to Philadelphia, **R. Roedder** to Los Angeles.

Eutetic Welding Alloys Corp.—The appointment of **F. F. Roehll** as National Sales Manager, has been announced.

Wrought Washer Mfg. Co.—**Lawson Adams** has been named Executive Vice-President and **Walter F. Borges**, Vice-President in charge of sales.

The Four Wheel Drive Auto Co.—**James A. Driessen**, Treasurer and Asst. General Manager, has been elected to the Board of Directors.

Borg-Warner Corp., Morse Chain Division—**J. Nall Candler** has been named Administrative Asst. to **F. M. Hawley**, President and General Manager.

The Electric Auto-Lite Co.—The appointment of **Daniel M. Sharpe** as As-

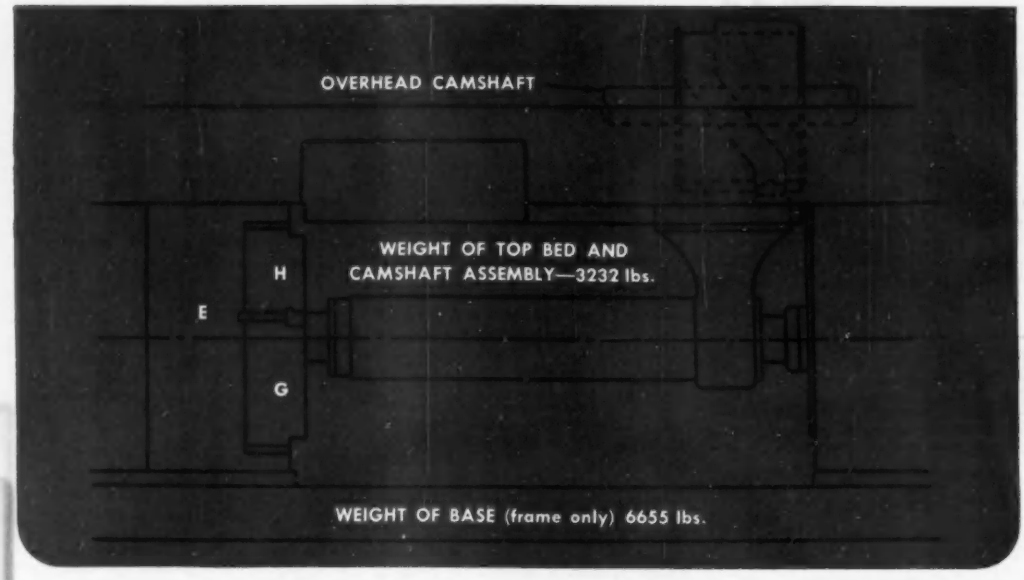
(*Turn to page* 120, *please*)

Necrology

George W. Rumford, 68, retired operating manager of Chrysler Corp.'s De Soto plant, and a pioneer automobile executive, died on Aug. 2 in Detroit.

John Nicol, 69, board chairman, Divco Corp., died at Leonard, Mich., on July 22.

Fred G. Rumball, 52, director of West Coast purchasing, Ford Motor Co., died on July 30 in Los Angeles.



PROFITS BEGIN WITH GOOD BUYING

Machine selection is often the difference between profit and loss, and the choice of one brand over another can be a vital decision. A machine that is not put to its best use is theoretically idle. A poor selection takes toll of all brands of the same type through greater sales resistance and cost. The information prepared for better machine selection before the purchase should be as thorough and useful as that of the operation and maintenance hand books supplied after.

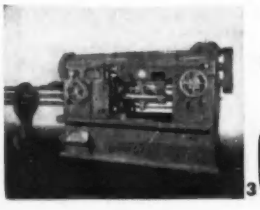
The information given above and below is useful in determining the facility of the 1½" Six Spindle CONOMATIC MAIN CROSS SLIDES:

1. **They have never been equalled for dependable, low cost operation and maintenance in the handling of wide, heavy, form cuts.**

The four, rectangular, box type, CROSS SLIDES, H and G, on front and rear sides of the machine, are nickel moly iron normalized. Their total weight is 296 lbs. They are held in axial position by retaining gibs against the finished wall surface of the machine frame support. They are held in parallel, radial position by their top and bottom flat bearing surfaces with tapered gib adjustment. The total area of their radial bearings, alone, is 444½ square inches.

2. **They have a higher maximum load recommendation than do the cross slides of other "automatics."**

The maximum load recommendation for each MAIN CROSS SLIDE is 3200 ft. lbs. The short (22" high) 11¾" by 44" Frame Support, E, weighs 802 lbs. net. It holds the slides between, and in close proximity to, nearly FIVE TONS of "bridged" construction.



Buyer's Comparison Chart will guide you to full information

A Comparison of ALL Automatics is in Favor of Cone

Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.

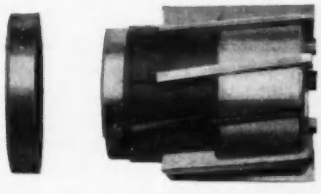
Select BARBER-COLMAN REAMERS FOR COST CONTROL *and* SIZE-FINISH CONTROL

ON-THE-JOB *Features*

LOW-COST BLADE REPLACEMENT

EASY SIZE ADJUSTMENT

CONTROLLED SIZE, STRAIGHTNESS, ROUNDNESS AND FINISH



All Extra Parts Eliminated. Pins and Wedges Hold Blades Solidly Against Body, Comparable to Solid Flute Design.

If you choose between accurate, quality reamed holes — and low-cost reamer maintenance and operation — you can have both by using Barber-Colman Adjustable Reamers.

Barber-Colman pin and wedge design provides more blades per reamer diameter for better cutting action. Blades are solidly held in perfect diameter, avoiding any possibility for variation in roundness or straightness. Size adjustments are easily and quickly made, with size readily checked across any two blades.

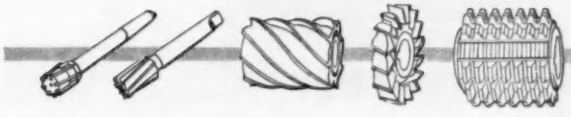
These features mean better and faster results, with less cost per hole machined. Ask Barber-Colman reamer engineers to assist on your reaming jobs, or send tool and part prints for recommendations.

Free **PRODUCTION DATA**

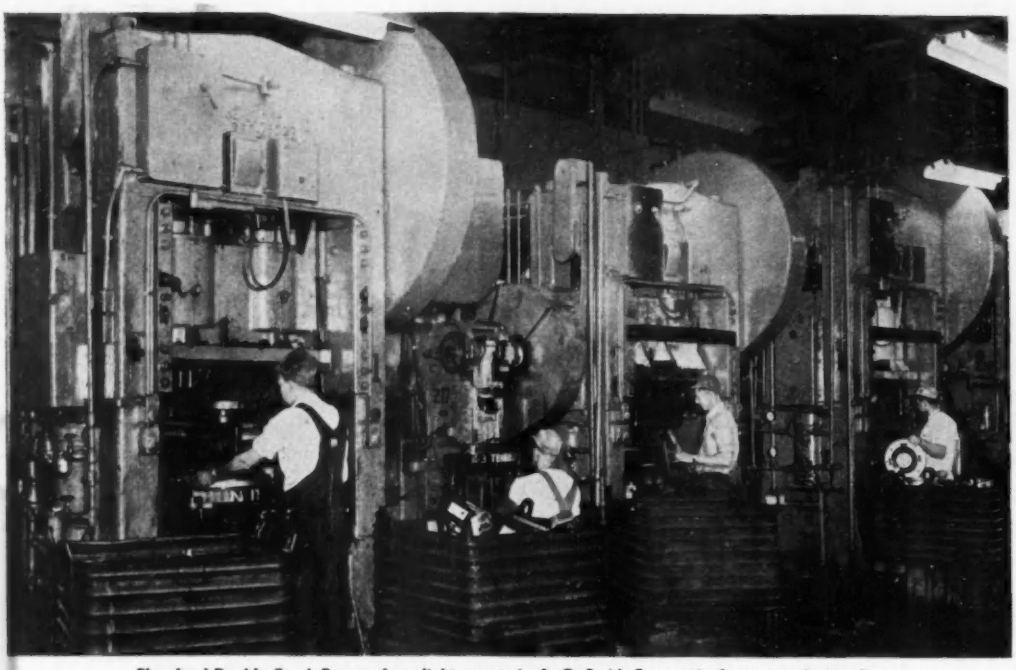
Current Case Histories of Reaming Jobs Taken Directly From the Field. Get a Set Today. Ask For File 9633.

Barber-Colman Company

GENERAL OFFICES AND PLANT, 9633 LOOMIS ST., ROCKFORD, ILLINOIS, U. S. A.



BARBER COLMAN



Cleveland Double Crank Presses form lighter parts in A. O. Smith Corporation's new production line.

A. O. SMITH Corp.

chooses CLEVELANDS again!

Recently, at their Kankakee Works, the A. O. Smith Corporation decided to produce several parts that they had been purchasing. This decision required the addition of a battery of 5 new presses. We are justifiably proud that, on the basis of production performance, Clevelands were chosen. It was recently reported, by this well-known corporation that, "Every Cleveland Press in the entire line is performing exceptionally well and is very satisfactory in every respect."

This report is typical of the comments made about Cleveland Presses by leading Press users. If you do forming, blanking, trimming, punching, drawing or similar operations, let us show you how you can do a faster, more economical job with a new Cleveland Press.

We will gladly furnish you with information on any type or size of Press . . . our engineers will gladly work with you on special problems.

A-3262

THE CLEVELAND PUNCH & SHEAR WORKS CO. USA

Established 1880

PUNCHING TOOLS & DIES

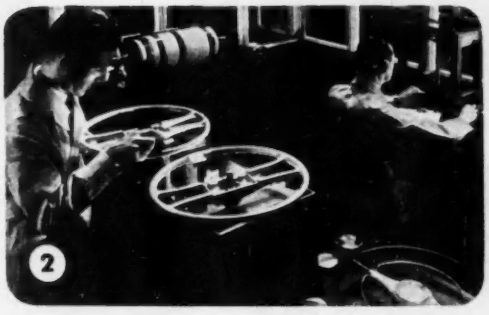
FABRICATING TOOLS

POWER PRESSES

OFFICES AT:
NEW YORK....CHICAGO
DETROIT....PHILADELPHIA
PITTSBURGH

CLEVELAND 14, OHIO

Not "answers" ...but "THE answers"



Many problems of the automotive and aviation industries have become *products* at Inland . . . because Inland has produced the *one correct answer* in these five ways.

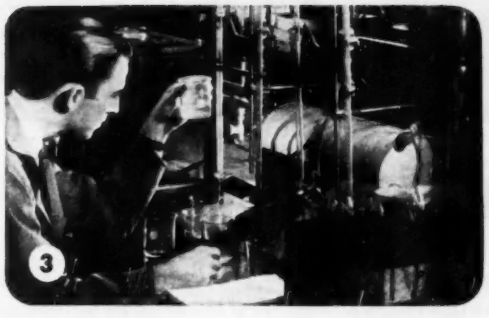
1. Design. Inland products are designed, first of all, to *work* supremely well. But often, as with steering wheels, it's a matter of appearance too. And here designing means combining utility with style that's appealing, saleable.

2. Engineering. Inland engineers translate designs into functional models, using fully the chemical, physical and metallurgical sciences . . . working out problems in uniting metals, rubber, plastics and other materials.

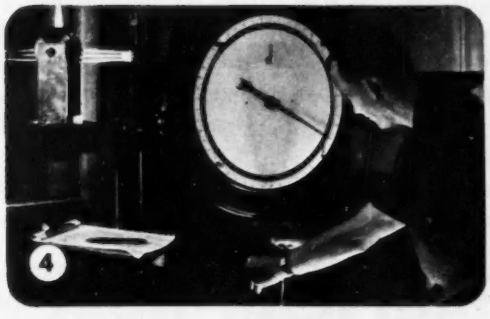
3. Laboratory Control. "Sure, this engineering model works perfectly. But will the production job work like that?" A very sound question. Inland answers it with constant laboratory control of all production processes.

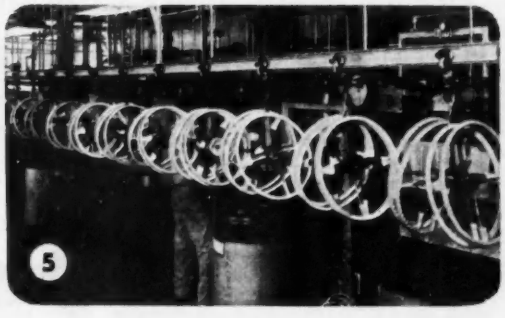
4. Testing. What will the product do? And how well? And for how long, under the most murderous conditions conceivable in any kind of service? All Inland products get such tests.

5. Volume Production. Precision in manufacture. Exact duplication of production-line parts or products. Inland strives constantly to make the first piece, or the millionth, or the ten millionth, or any piece chosen at random in between, precisely like all others.



INLAND MANUFACTURING DIVISION
General Motors Corporation • Dayton, Ohio



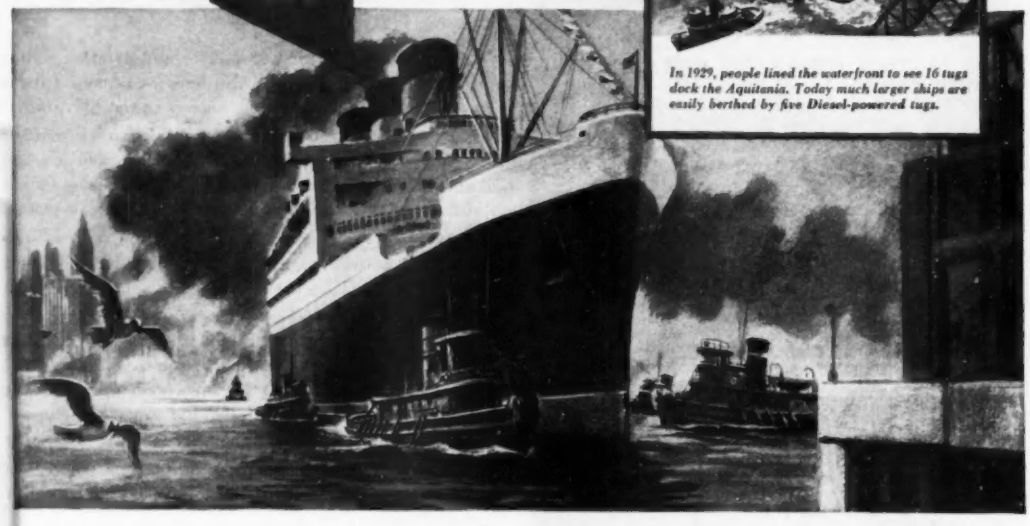


INLAND MANUFACTURING

WHERE PROBLEMS BECOME PRODUCTS
in Rubber, Metals, Plastics and Friction Materials

What important thing was necessary to change THIS to THIS

In 1929, people lined the waterfront to see 16 tugs dock the Aquitania. Today much larger ships are easily berthed by five Diesel-powered tugs.



1. ***Development and Field Engineering.***
American Bosch engineering departments and laboratories work constantly to improve existing products, develop new ones such as the revolutionary single plunger multi-cylinder PSB Pump. Our field engineers work hand in hand with engine and equipment manufacturers — from original design to test models and actual field operation.

2. ***Precision Manufacture.***
The knowledge and craftsmanship that made solid fuel injection a reality . . . plus engineering research, proven techniques, unparalleled production and testing facilities (many of them initiated and developed here) . . . insure uniform adherence to the highest standards of accuracy and performance.

3. ***Service Organization.***
In many U.S. cities and at strategic points throughout the world, American Bosch maintains an ever-growing network of authorized service stations. Staffed by personnel trained to factory standards, with factory-designed and built testing equipment, they are prepared to render efficient and reliable service whenever needed.

Dependable Fuel Injection

Many things — and many men — have contributed to the progress of Diesel power. But one vital element necessary to make this efficient, economical source of power universally applicable was dependable solid fuel injection.

American Bosch was a pioneer and still is a leader, in this field . . . a position established and maintained by American Bosch development and field engineering, precision manufacture and its ever-expanding network of service agencies.

You can depend on premium performance when the fuel injection system bears the name American Bosch.

American Bosch

Dependable Fuel Injection for the Diesel Industry

AMERICAN BOSCH CORPORATION, SPRINGFIELD 7, MASS.

Magnetos • Generators • Voltage Regulators • Ignition Coils • Electric Windshield Wipers • Diesel Fuel Injection Equipment

RECOMMENDED FOR

PAT. 2319067

VICTOPRENE TYPE K OIL SEALS

for positive sealing with up to 40% less frictional drag

A — Victoprene sealing element with hammerhead design making narrow line contact with shaft, provides maximum flexibility of sealing action with minimum frictional drag.

B — Victoprene element is chemically bonded and integrally molded with perforated steel washer. Prevents leakage through shell.

C — Lightweight garter spring, held in position by molded "V" groove, maintains uniform pressure on sealing element for perfect contact with shaft surface.

D — Double outer wall construction gives rigidity to metal case; prevents distortion.

E — Centerless grinding of outer periphery assures a truly circular case giving accurate press fit with bore.

F — Permanent identification with catalog number makes replacement easier.

ENGINEERING DATA ON TYPE K SEALS

Operating Condition	Maximum Recommended Limits
Shaft Surface Speed	2,000 f.p.m.
Operating Pressure	10 p.s.i.
Shaft Surface Finish	5 to 25 Micro Inches
Shaft Surface Hardness	Minimum 30 Rockwell C Scale
Shaft Eccentricity	.008" T.I.R.
Shaft Diameter Tolerance	.002" Plus or Minus
Temperatures:	
Continuous Operation	225 Deg. F.
Intermittent Operation	250 Deg. F.
Shaft Movement	Rotation and Oscillation

OTHER TYPE SEALS IN THE VICTOPRENE LINE

TYPE K is a refinement of the Victor *controlled lip* pressure principle in metal-encased seals, which reduces frictional drag on shaft up to 40% over conventional seals. Victor integrated single unit construction, with molded and bonded seal element, assures a precision-made, totally leakproof structure. The Victoprene seal element—a superior compounded synthetic elastomer—gives positive sealing of rotating or oscillating shafts under all working conditions within scope of recommendations above.

TYPE K seals are made in a wide range of sizes; all sizes being dimensionally interchangeable with Victor Type H seals.

Engineering Catalog Sent on Request

Write on your letterhead for Victor Oil Seal Catalog No. 304 giving complete technical data on TYPE K Victoprene seals and others in the complete Victor Line. No obligation.

When you need oil seals, gaskets, or packings, look first to Victor—the leader in sealing products research and manufacturing. The Victor engineer in your territory is always at your service.

Victor Mfg. & Gasket Co. and its affiliate, Victor Sealing Products Co., Inc., P.O. Box 1333, Chicago 90, Illinois.

SEALING PRODUCTS Exclusively

VICTOR GASKETS AND OIL SEALS

VICTOR

World War II Equipment Produced by Major Motor Vehicle Companies

General Motors Corp.

Shells	119,562,000
Cartridge cases	39,181,000
Airplane engines, including jet propulsion engines	206,000
Complete bomber and fighter planes	13,000
Aircraft propellers	97,000
Aircraft gyroscopes	301,000
Tanks, tank destroyers and armored vehicles	38,000
Trucks including the amphibious Ducks	854,000
Cannon	190,000
Machine guns and sub-machine guns	1,900,000
Carbines	3,142,000
Electric motors of all kinds	3,826,000
Fuses	11,111,000
Ball and roller bearings	360,000,000
Diesel engines for Army and Navy use and many other products	198,000

Chrysler Corp.

Atomic bomb manufacturing equipment (carloads)	1,000
B-29 Engines (Wright-R3350)	18,413
B-29 Noses	568
B-29 Leading edges (sets)	559
B-29 Cowling sets	4,752
4.5" Rockets	328,367
Tank Grouser kits	2,056
20 mm shells	1,989,801
Incendiary bombs	101,232
New tanks	22,235
Modified tanks	3,272
Total tanks	25,507
Bofors 40mm anti-aircraft guns	58,979
Army trucks	437,892
Field ranges	62,186
Gilder ski pedestals	163,290
Curtiss Wright wings	5,669
Corsair landing gears	10,202
Sperry gyro-compasses	5,500
Marine engines	28,930
Bomb shackles	364,870
Duraluminum forgings	12,073,608
Air-raid sirens	349
Fire pumpers	29,683
Radar antennae mounts and trailers	2,098
45 cal. ammunition (rounds)	2,768,628,091
30 cal. ammunition (rounds)	485,448,758
Total (rounds)	3,254,076,849
50 cal. armor piercing cores	222,000,000
20 mm projectile balls	19,930,932
20 mm practice projectiles	3,000,000
New tank engines	9,965
Modified tank engines	2,585
Total tank engines	12,550
Martin B-26 noses	1,595
Martin B-26 center sections	1,586
Martin B-26 inboard flaps	1,895
Martin B-26 outboard flaps	1,895
Douglas wing nose cap assemblies	997
Submarine net panels (total 95 miles)	1,994
Searchlight reflectors	1,550
Two-speed generator units	2,100
Navy pontoons	9,002
Smoke screen generators	253
Propeller balancing stands	3,032
3 in. shell forgings	671,770

Ford Motor Co.

B-24 bombers	8,685
2000 hp Pratt & Whitney engines	57,851
Jet bomb engines	2,411
Tank engines	26,979
Amphibians	12,778
Jeeps	277,896
GST military trucks	77,604
Jettison gas tanks	17,008
Generators (aircraft)	87,390
Gliders	4,203
Armored cars	12,564
Universal carriers	13,893
Superchargers	52,281
Rate-of-climb indicators	5,360
Magnesium (in tons)	4,889
Ford engines	17,670
Ford axles	17,639
Anti-aircraft directors	1,202
M-4 tanks	1,690
M-10 tank destroyers	1,038
Bomb service trucks	7,053
Cargo trucks (Navy)	2,218
(Ordnance)	6,001
Squad tents	9,498
Moto tugs	3,025

Detroit Viewpoint to War

By Leonard Westrate

With the Korean war more than a month old and with a little more opportunity to evaluate its effect on the automobile industry, it now appears likely that there is to be no immediate conversion of automobile plants to war production and no particularly severe effect on vehicle production in the near future. Military orders are of necessity in the category of restricted information, but the automobile manufacturers are quite frank in saying that up to now they have not been requested (with the exception of GM) to take an active part in the war production program but are ready to do so.

Another intangible factor is the unpredictable course of military developments. In short, nobody knows what is going to happen and the best that can be made in the way of a hesitant forecast is that at least for the time being civilian production of motor vehicles has a good chance of continuing at about its present rate.

So far as any direct war work is concerned, the only major project up to the first week in August was an agreement between General Motors and the military for GM to build tanks in a government plant at Cleveland operated by Fisher Body during World War II. So far as is known now GM's contribution will be in the form of management ability but no use of existing GM facilities is contemplated at this time.

There are, of course, large military truck orders in the works, but, as has been pointed out, these were com-

Automobile Industry's War II Total

Complete airplanes	10%
Machine guns	47%
Carbines	56%
Tanks	57%
Armored cars	100%
Scout cars and carriers	92%

on Conversion Production

mitted for long before the Korean war started and would have been placed regardless of whatever the current international situation might be. There also is some evidence that the military has stepped up its program of placing development work with the automobile companies, but if any orders for actual war work in automobile plants other than the GM contract have been let, they are being kept strictly secret. One of the most reliable bellwethers of military programs is the machine tool industry. While the tool builders report that business is at a high level they say that orders are for machines to be used principally in civilian production and that they have had little indication on orders for tools to be used strictly on military work.

One important point to remember is that the situation may change from day to day, depending on the progress of world events. However, as of now automobile plants have been in no way affected so far as facilities are concerned and are moving ahead at full speed building cars and trucks to the absolute limit of steel and other materials available. It appears now that the most immediate result of the greatly expanded military program will be on materials, principally steel, although copper, nickel, and some other metals show evidence of short supply. It is entirely possible that as military orders get into production, the supply of materials available for civilian goods will shrink, imposing a limit on production of cars and trucks. There also has been some talk about an arbitrary percentage curtailment of vehicles, but nothing definite from any official source has yet been forthcoming. The reports, and it should be remembered

(*Turn to page* 98, *please*)

Percentage of World Equipment Output

Torpedoes	10%
Land mines	10%
Marine mines	3%
Army helmets	85%
Aircraft bombs	87%

Source: Automobile Manufacturers Association

World War II Equipment Produced by Major Motor Vehicle Companies

Hudson Motor Car Co.

Bomb wing sections for B-29 and B-26
Fuselage sections for B-29
Oerlikon guns
Extrusion sections for radar
P-38 wings
Aircraft engines
Cabins for Bell-63 aircraft
Ammunition boxes
Auxiliary gas tanks for aircraft
Mine anchors
Machined pistons and rocker arms for aircraft
Ailerons
27 mm shot
Machined parts for Diesel and aircraft starters
Wings for Curtiss-Wright
Operated Naval ordnance arsenal for Government
Note: Amounts for above items not available

Nash-Kelvinator Corp.

Rocket motors with nozzles	204,016
Helicopters	219
Propellered governors	290,262
Feathering accessories for propellers	127,881
Binoculars, cases and spare parts manufactured by Nash-Kelvinator and Ranco	274,978
Hydromatic propellers	158,134
Bomb fuses	654,153
Carburetor castings	385,813
Aircraft engines—three types	16,987
No. 8 used in Vought-Sikorsky Corsair	
No. 10 used in Grumman Hellcat	
No. 65 used in the P-61 Black Widow Army Spider	
Spare propeller blades	85,656
Cargo trailers	44,628

Millions of parts for aircraft carburetors, propellers, tanks, jeeps and other war products were manufactured under sub-contract for other manufacturers at Nash-Kelvinator plants in Kenosha, Milwaukee, Detroit and Grand Rapids. A wide range of parts was produced in Kenosha including forgings, gray iron castings, tools, dies, landing gear parts, track link forging and machined propeller parts.

Willys-Overland Motors, Inc.

155 mm shells (7 types)	4,242,105
Forgings for other shells	93,396
30 cal. bullet cores	743,977,699
50 cal. bullet cores	461,332,235
¼-ton 4x4 trucks (jeep)	360,372
¼-ton trailers	64,250
1-ton trailers	14,777
40 mm fuses	116,980,000
40 mm primers	97,660,000
Bomb cluster shipping bands	27,500
Aluminum forgings—(total weight 19,162,540 lb)	8,288,284
Landing gears	6,098
Powder and projectile hoists	415
20 mm shells	2,000,590
Recoil cylinders	2,298
Breech housings	2,056
OCD fire pumps	1,000
Center wing sections, Vought-Corsair plane	3,731
MX air frames	1,320
Fuel tanks	3,065
Air scoops	496

Packard Motor Car Co.

Rolls-Royce aircraft engines	55,000
PT boat engines	13,000
Steel shells	(no number given)

The Studebaker Corp.

M29C cargo carriers (Weasel)	15,603
Wright Cyclone airplane engines	64,789
Military trucks (2½-ton)	197,678

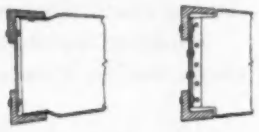


Fig. 1—The sandwich joint illustrated at the left is difficult to fit and usually results in bowed ribs or pulled flanges. Preferred mounting is shown at right.

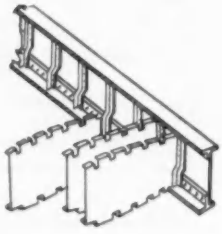


Fig. 2—Preferred method for mounting ribs to spars with formed angles riveted to both front and rear spars.

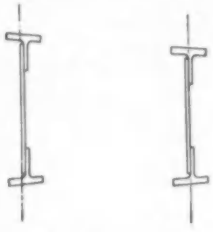


Fig. 3—In the left illustration of spar web mounting, change to incorporate thicker web will result in protrusion out of contour. Web thickness increase is easily accomplished in illustration at right.

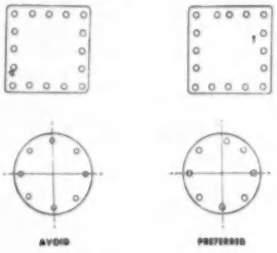


Fig. 4—Offset hole in each illustration at the right allows but one method of attachment, simplifying tooling.

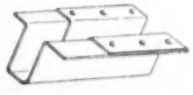


Fig. 5—Nesting of formed sheet metal parts should be avoided.

Producibility

By E. O. Baumgarten and A. C. Slatter

Production Design Engineers,
North American Aviation, Inc.

PRODUCIBILITY in airframe manufacture is not the result of any one department's effort but is more the outcome of a combined processing by all concerned. Engineering's contribution is in the production breakdown of the airframe, as well as in efficient design and a minimum of drawing changes. Generally, the model specifications, preliminary layout and the functional group's requirements locate the major breaks in the airframe. Mock-up of the airplane will perhaps introduce new breakdown points for serviceability as a result of full scale examination of the ship. Army-Navy Aeronautical Specification AN-1-21 defines interchangeability and replaceability requirements, and in most cases sectionalizing the airframe for field service breaks will be compatible with the requirements of a production breakdown. Air Force requirements on producibility were discussed in an article which appeared in the January 1, 1949 issue of AUTOMOTIVE INDUSTRIES.

There are three types of joints in airframe construction: 1. A manufacturing joint is one in which the jigs and tools available only in the manufacturer's plant must be used to locate and mate the parts. 2. Semi-field service joints are for replaceable assemblies and can be made at operational stations with a minimum amount of tooling by drilling or reaming of mating holes. Wider tolerances are allowed than in a manufactured joint. 3. Field service joints imply direct interchangeability with no filing, drilling, reaming, trimming, forming or riveting. The tooling indexes from the mating holes and requires accurate rigid jigs for construction, but no tooling is needed for field service replacement.

Were it practical, the construction of the airframe would be easier in latter stages if all joints were of the field service variety; that is, if every item could be brought to a point and merely joined together with a few strategically placed bolts. The penalty for this type of design would be an excessive weight loss in fittings, fitting support, and large bolts, plus a greater complexity of unit tooling. On the other hand, were the airframe made up only of manufacturing joints the result would be in the lightest form but with no adequate breaks for field replacement. The assembly floor space required for quantity production under such conditions would be prohibitive. It can be seen

as Applied to Airframes

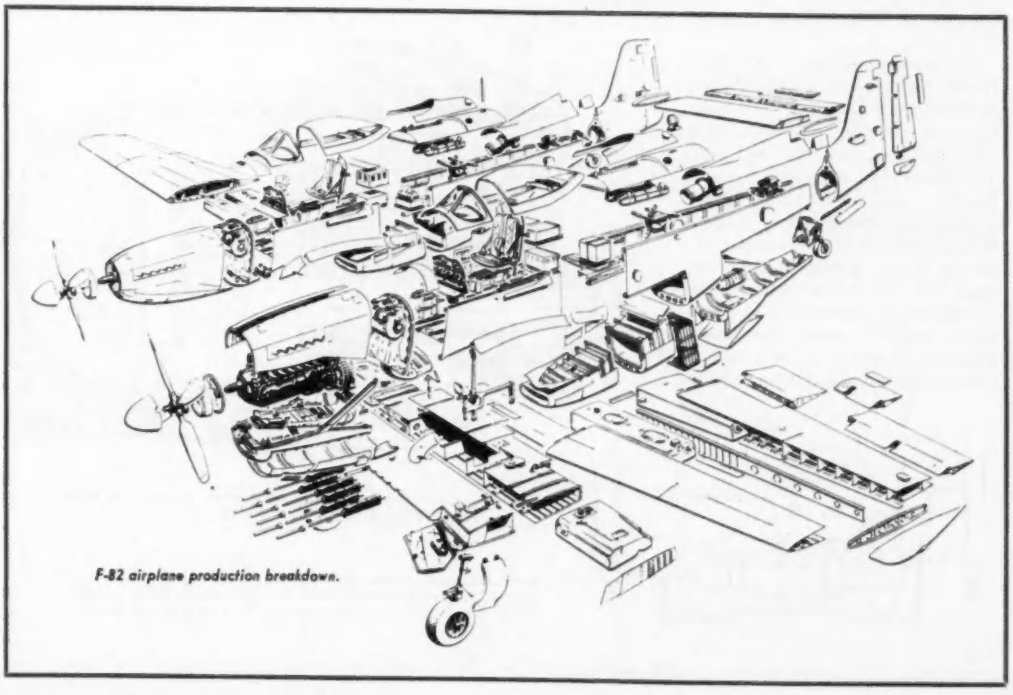
that a combination of the described joints must be utilized to effect the compromise which is an airframe assembly.

The wing gets broken down around its backbones —the spars, which are readily tooled for, and make for, an excellent basis to which to attach skin sheet assemblies. These in turn may be built around false spars. Manufacturing joints at this stage are almost all of riveted, lap configuration. The main wing structure will come together in a main assembly jig which will hold contour, main attach joints and functional group attaching points (such as landing gear) to desired tolerances. Hinges attaching leading and trailing edge assemblies, so connected for field maintenance ease and ready shop attachment, will be indexed on sub-assembly jigs by lobe and pin locators. The wing breakdown may be split further into replaceable panels at field service joints for ease of handling and repair, and into doors and cover panels for fuel cells, weapons, etc. These complicate the breakdown, requiring additional sub-assembly jigs and locating fixtures for their incorporation. Wing design usually lends itself to economical sub-assembly breakdown because of the spar-rib framework but the tendency is to reduce the number of splices and breaks by such devices as large milled sheets and long stringers used because of weight and manufacturing time savings realized thereby. This compromises the handling ease characteristic of sub-assembly construction and also introduces a material procurement problem.

Experience indicates that some sandwich fits will result in interferences and should be avoided. This applies anywhere in the airframe, not only in the wing. An example of this type of sandwich fit is shown in Fig. 1.

Mounting ribs to spars should be done by mounting angles on both front and rear spars with the angle legs arranged so that all the ribs approach the angles from the same side as illustrated in Fig. 2. The distance between spars is nearly impossible to coordinate if the ribs contain the flanges, and if but one flange is bent into the rig the angle bend is often slightly in error bringing the rib out of contour after the

(*Turn to page* 60, *please*)



F-82 airplane production breakdown.

British Jeep

Has 80 Hp Engine and Independent

LONDON, ENGLAND

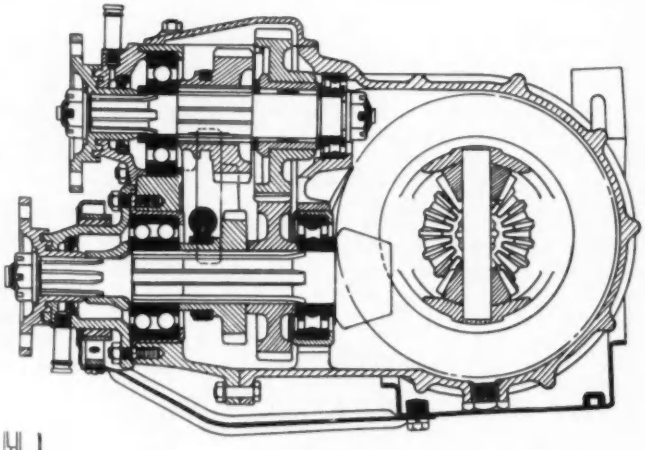
A BRITISH Jeep has been announced by the Ministry of Supply's Fighting Vehicle Design Deparment. The new vehicle was developed by Nuffield Mechanisation Ltd., and its design standardized to facilitate quantity production in other plants. Compared with the original American Jeep, the British version has higher power and has independent suspension all round. It is said to be better equipped for going through water, and to have greater accessibility with reduced maintenance, greater comfort, and more storage space.

Early pilot models designed and produced by Nuffield Mechanisation were frameless, stressed skin construction. All wheels were independently sprung and the four-speed transmission, as well as a high and low range auxiliary, were located in the rear axle housing. The power unit was a horizontally opposed four cyl engine developed by the Nuffield Co. This design met with much criticism, and was dropped in favor of the present type.

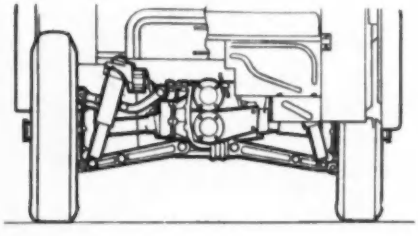
The latest model has an X-shaped frame, rigidly cross braced and reinforced wherever possible by welding to it the floor, bulkhead, front wheel valences, and front seat pans. The frame is built up into box section from spot-welded pressed steel.

All-round independent suspension was chosen as offering less unsprung weight, greater wheel movement, and high roll resistance. The suspension system consists of trapezoidal support arms, the lower members of which are attached to torsion bars arranged diagonally in the frame. Having no pre-setting, the torsion bars are interchangeable among all four locations and all are secured at the center of the frame in anchorages which provide individual adjustment. Each snubber consists of a tapered rubber cone seated on the frame in an inverted oversize cup. This gives an increasing rate characteristic.

Steering is rack and pinion type. The steering rods are tubular and each rod forms an oil reservoir for lubricating the ball joints. The gearbox provides five speeds, each fitted with a large Warner type blocking synchronizer, all of which are interchangeable. At 3750 engine rpm, speeds in the five gears are 60.7, 39.7, 25.4, 17, and 11 mph. The reverse gear is incorporated in the rear wheel drive assembly, together with the transfer case and power take-off. Control is by two levers, one for forward, reverse, or winch, and the other for two- or four-wheel drive. Axle housings are



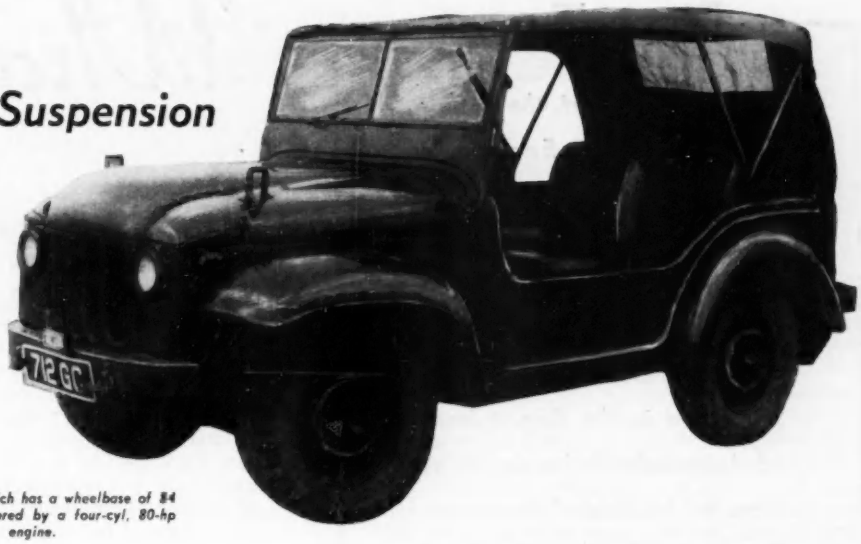
(Above) Sectional drawing showing arrangement of rear axle which incorporates the transfer case and power take-off.



(Left) This drawing shows the independent rear suspension with wishbones of unequal length and lower wishbones splined to torsion bars. The front suspension is almost identical. (Courtesy of The Autocar, London)

By W. F. Bradley
Special European Correspondent for
AUTOMOTIVE INDUSTRIES

Wheel Suspension



British Jeep which has a wheelbase of 84 in. and is powered by a four-cyl, 80-hp engine.

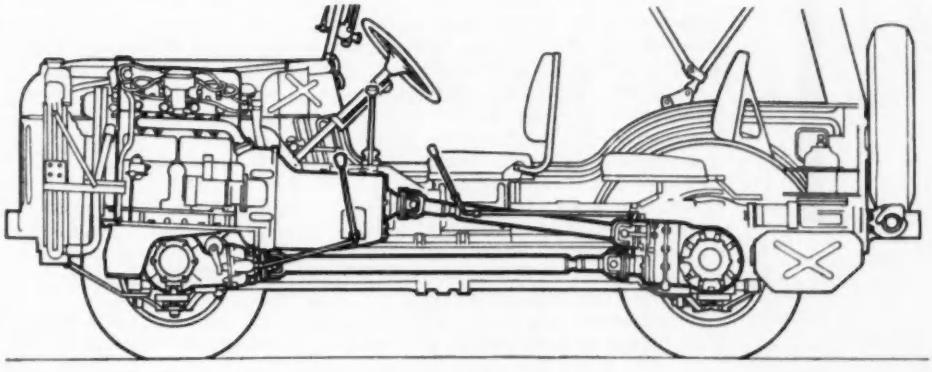
resiliently mounted to suspension cross members which can be unbolted and removed from the frame as a complete assembly. The articulated axle shafts are fully enclosed and provided with constant velocity universal joints at their inner and outer ends.

The engine is a standardized four-cyl, F-head, Rolls Royce type, with a 3.5 in. bore, 4.5 in. stroke, and a piston displacement of 173 cu in. With a compression ratio 6.4 to 1, it develops 80 hp at 3750 rpm. Maximum torque is 147 lb-ft at 1750 rpm. The carburetor is a horizontal Solex and the air cleaner a Vokes 135 cfm.

The cooling system is pressurized to 10 psi. The shrouded 10 blade fan is driven through a friction clutch to prevent damage when under water. A governor, incorporated in the distributor rotor, grounds the ignition at 3750 rpm. Two 12 volt batteries are used, the 24 volt supply being used throughout except for the low tension ignition circuit, which operates on 12 volts. The ignition system is completely waterproofed and shielded against radio interference. Provision is made for the entire power package—engine, radiator and gearbox—to be removed as a unit.

Present tire equipment is 6.50-16 but tests are being made to see whether a larger tire of 7.50 section gives better performance in soft going without chains. Clearance exists for this size tire if chains are not used. Wheelbase is 84 in. and weight of the vehicle is 3470 lb.

This part-sectional view shows arrangement of the propeller shafts, transfer case, transmission, etc., of the Btirish Jeep. (Courtesy of The Autocar, London)



What Is

Part Two

In This Second Part, the Author Traces Russia's Economic Growth Since 1940 and Shows How Setbacks which Occurred During the War Have Been Largely Overcome. Part I of This Two-Part Article, Which Appeared in the Aug. 1 Issue of Automotive Industries, Was Devoted to Natural Resources, Transportation Facilities, and Production Methods of the Soviets.

ECONOMIC DEVELOPMENT 1940-1950

PREWAR POSITION—In 1940, after fifteen years of economic recovery and growth, the Soviet Union was the greatest industrial power in Europe except for Germany. Its population totaled nearly 200 million, including 34 million men aged 20-44, its non-agricultural labor force was close to 30 million (see Table II). In that year, Russia produced 142.5 million metric tons of coal plus 23.5 million metric tons of lignite, 31 million metric tons of petroleum and natural gas, 18.3 million metric tons of steel ingots and castings, 5.8 million metric tons of cement, about 40 million metric tons of wheat, and four billion meters of cotton cloth. Its electrical capacity reached 11.3 million kilowatts by the end of the year. Its railroads, with 30,000 locomotives and 570,700 two-axle and 191,700 four-axle freight cars, carried a traffic of 282 billion net ton-miles, second only to the United States. In comparison with this country in the same year, Russia's national income was at least 40 per cent as great, although its mineral consumption—an index closely correlated with total durable goods output—was only 23 per cent of that of the United States (Table III).

Soviet mobilization for the war with Germany had begun in 1937 and was well under way by 1940. Budgeted defense expenditures jumped from 17.5 to 56.1 billion rubles during this period. Munitions production more than tripled, while the expansion of basic industrial capacity virtually stopped. The Armed Forces grew to some five million in strength. In June, 1940, the work week was lengthened from an average of 40.8 to 48 hours, with stringent disciplinary provisions. In October, 1940, mobilization of 14 to 17-year-old boys and girls for compulsory training and work in the factories and on the railroads was inaugurated. Finally, the stockpiling of critical raw materials, such as nickel, molybdenum and rubber, as well as fuels and grain, was feverishly under way.

WARTIME CHANGES—Immediately after the German attack on June 22, 1941, the Soviet Union shifted to a war economy. A small war cabinet or Supreme Defense Council assumed unified political, economic and military control of the nation. The State Planning Commission shifted its functions from long-range planning to immediate operational control of the economy, especially the expediting of urgent war construction, and the rigid allocation of raw materials, transportation, and electrical power. The People's Commissariat for Medium Machine-Building was transformed into that for Mortar Armaments, while the one for Automotive Production supplied light tanks, artillery prime-movers, armored cars, and field artillery.

But initial Soviet plans proved to be insufficient. On August 16, 1941—the day of the German break-through in the Ukraine—a more radical "Military-Economic

Russia's Industrial Strength?

By Demitri B. Shimkin

Consulting Editor of Automotive Industries on Russian Industrial Affairs; Russian Research Center, Harvard University

Plan for the IVth Quarter of 1941 and for 1942" had to be inaugurated. This plan was based upon maximum industrial evacuation to, and maximum munitions output in, the Volga Region, the Urals, Western Siberia, Kazakhstan, and Central Asia. In the fall and winter of 1941, 1360 large plants—a quarter of them from Moscow and Leningrad—were evacuated eastward. Of those plants, 200 were installed in the Volga Region, 455 in the Urals, 210 in Western Siberia, 250 in Central Asia and Kazakhstan, with the destinations of the others unstated in available sources. Above all, German advances, by November, 1941, had deprived the Soviet Union of 63 per cent of its coal production, 58 per cent of its steel, 60 per cent of its aluminum, 38 per cent of its grain acreage, and 41 per cent of its railroad mileage. In addition, 303 munitions plants with a monthly capacity of 11.1 million artillery and mortar shells, and 27,900 metric tons of explosives production were lost. Because of these events, Russia's industrial production declined by December, 1941, to less than half of its June, 1941, level, while output of such vital commodities as non-ferrous fabricates and ball bearings virtually ceased.

To avert catastrophe, the Soviet government took drastic measures. Civilian consumption was ruthlessly cut back. Virtually no gasoline or lubricants, for instance, were made available to civilian trucks and tractors, which had to run on firewood, lignite or peat, and use even turpentine for lubrication—or stop

Table II Comparative Output Figures: East and West

		East				West				
		USSR		European Satellites[1]	Total A	US	UK	Canada	Total B	Ratio A/B
Factor	Unit	1940	1949	(1948)	(1949)	1948	1948	1948		
Population	Millions	198	(200)	88.4	289	144	49.5	13.0	206.5	1.4
Non-agricultural labor force	Millions	(29.6)	(34.0)	21.9	55.9	43.4	19.8	3.2	66.4	0.8
Wheat	Millions mt	(40.0)	(40.0)	5.9	45.9	35.0	1.8	10.7	47.4	1.0
Maize	Millions mt	(3.5)	(3.5)	8.1	11.6	60.5	....	....	60.5	0.2
Cattle, head	Millions	54.5	(50.0)	16.9	66.9	78.6	9.2	8.9	96.7	0.6
Coal	Millions mt	142.5	(200)	89.5	(290)	590.6	210.8	15.3	816.7	0.4[2]
Lignite	Millions mt	23.5	(50)	41.8	(91.8)	2.4	....	1.4	3.8	
Crude Petroleum	Millions mt	31.0[3]	34.2[3]	4.5	38.7	276.2	....	1.5	278.7	0.14
Steel Ingots	Millions mt	18.3	23.6	4.8	28.4	80.3	15.1	2.9	118.3	0.24
Copper (primary)	Thousands mt	(110)	194	31.0	225	839.6	74.3	192.9	1106.8	0.20
Aluminum (primary)	Thousands mt	56.7	99.0[4]	5.1	104.1[4]	565.0[5]	30.5	372.5[5]	968.0[5]	(0.1–0.15)
Cement	Millions mt	5.8	8.4	4.3	12.7	35.1	8.6	2.2	46.1	0.27
Electrical Power	Billion kwhr	48.3	(68)	(30)	(98)	336.6	44.0	44.6	425.2	0.23
Cars and Trucks	Thousands	208	(440)	14	(444)	4798	442	258	5498	0.08

Notes: Figures in parentheses are approximate; mt = metric tons.
[1] Albania, Bulgaria, Czechoslovakia, Eastern Germany, Hungary, Poland and Rumania.
[2] Lignite at one-third of its physical weight.
[3] Including petroleum equivalent of natural gas.
[4] For 1947; up to 50% greater in 1949.
[5] Peak outputs, 1943: U. S., 834,800 mt; Canada, 449,700 mt.

What Is Russia's Industrial

running. To win the war, the Soviet civilian had to eat less than any other belligerent. The nation's human resources were completely mobilized; as a result, the percentage of women in the non-agricultural labor forces soared to 53 per cent in 1942, compared to 38 per cent in 1940. Lengthening of the work week to 66 hours, simplification of work processes, on-job training, incentive pay coupled with rigid stabilization of prices for the most essential commodities, and selective rationing helped compensate for the greatly lowered productivity of the mass of raw labor absorbed by the Soviet industrial machine. Materials were economized through substitutions, as of chrome for nickel steel in armor-piercing projectiles, and by wartime reductions in standards, applied to manufactures ranging from electrical machinery to trucks and gasoline. Railroad transportation requirements were reduced by increased local supply, particularly through the victory gardens of factories and of the Army's rear services; by fuel stockpiling during the summer months; and especially by the concentration of military supply on selected lines with equipment, siding and storage capacity, and personnel augmented to minimize turn-around time. Special organizations salvaged friendly and enemy equipment. Thus, the advancing Soviet troops were closely followed by ingenious rail-recovery trains, equipped to X-ray salvaged sections of units, cut off unusable parts, weld together the remainder, and finally trim them to standard lengths—all on a belt line. Finally, the Red Army repeatedly, above all at Stalingrad, depended on anticipated and achieved capture of enemy stocks for a significant part of its supplies.

Three factors beyond Soviet control greatly aided Russia's war effort. First, although the Germans greatly reduced the Soviet economic potential by the seizure of territories and by frontal attrition, they made no systematic attempts to conduct strategic air bombardment, particularly of Russia's transportation lines. Thus, the Soviet Union was able to execute its economic evacuation and redeployment, and to supply its armies without harassment. Secondly, because its allies relieved it of the need for significant naval forces or heavy bombardment aviation, the USSR was able to concentrate on a limited range of ordnance production. Thirdly, Lend Lease, including supplies from the United Kingdom and Canada, provided indispensable aid. The value of Lend Lease never exceeded 10 per cent of total Soviet industrial production, but in many critical areas of military supplies—copper, aluminum, signal equipment, trucks, etc.—it provided two-thirds and more. In fact, Lend Lease provided 20 per cent of the total mineral consumption of the USSR in 1944. In other instances, Lend Lease established new industries, particularly the production of aviation gasoline. Lend Lease also relieved sudden emergencies, such as the crisis in Soviet food supply after German occupation of the North Caucasus in 1942. Toward the end of the war, the Soviets used Lend Lease not only as a means of covering war-time requirements, but also to rebuild great stockpiles of nickel, molybdenum, truck tires, and other strategic reserves. Finally, the value of the industrial knowledge gained by the thousands of Soviet technicians in the United States alone is incalculable.

Together, all the factors mentioned permitted the Soviet Union to maintain and develop a major military effort. It trained, deployed and supplied an average of some 13 million men and women in its armed forces. In 1944, although its national income did not exceed a fifth that of the United States, and its mineral consumption, including Lend Lease, was but 14.8 per cent

Table III Indices of Mineral Consumption in the United States and Russia, 1926-1949

	1926	1932	1937	1940	1944	1947	1948	1949
United States:								
(1935-39 aver. = 100)	112.0	66.1	111.3	125.4	163.4	(170)	(180)	(170)
Soviet Union:								
(USSR 1937 = 100)	18.96	47.03	100.0	108.8	91.27	107.9	(120)	(140)
(U. S. 1935-39 aver. = 100)	5.05	12.5	26.6	29.0	24.3	28.7	(32)	(37)
USSR as percentage of U. S. consumption	4.5	18.9	23.9	23.1	14.9	(16.9)	(18)	(22)

Note: Figures in parentheses are approximate.

Strength?

THE memory of highly creditable Soviet war production between 1941 and 1945, coupled with postwar economic growth, and with Soviet capabilities of seizing the productive plants of Continental Western Europe, forbids complacency towards the potential military challenge of Russia's economy.

as great, Soviet munition output amounted to 35-40 per cent of the American. It approached equality in certain weapons. During the last three years of the war, the annual Russian output of tanks and self-propelled artillery averaged 30,000; of aircraft, primarily fighters and ground-attack aviation, 40,000; of artillery of 20 mm and higher, 120,000.

Furthermore, ordnance design was by no means static. It is true, of course, that some slightly modified weapons of World War I vintage, especially the Maxim type machinegun and several heavy artillery models, continued in use. But the bulk of Soviet ordnance consisted of designs developed between 1938 and 1940. Characteristic also was the progressive modification of these models to maximize their effectiveness. Thus the KV heavy tank, first put in production in 1940, increased its armament during the course of the war from the 76 mm to the 85 mm and, finally, to the 122 mm gun; with the assault-gun superstructure, to the 152 mm gun-howitzer. Greater thicknesses of armor increased its weight from 40 to 60 tons. Yet the engine, transmission and tracks remained unchanged. Mention must be made of the new weapons introduced by the Red Army toward the close of the war, such as the 160 mm mortar and the 100 mm anti-tank gun. But it is also essential to remember that the Soviet Union produced no radically advanced weapons, such as the German magnetic mine and V-1 and V-2 missiles, or the Anglo-American radar bombsight, proximity fuze or atomic bomb.

In other economic areas, Soviet achievements were more uneven. The civilian population suffered great hardships but comprehensive public-health measures and iron control of food supplies prevented epidemics like the typhus and influenza outbreaks of World War I, or famines like the disaster of 1921. Again, despite the extreme requirements of munitions output, the expansion of basic production capacity continued throughout the war, ameliorating war losses and reducing bottlenecks. Coal and lignite production in the unoccupied regions was expanded by more than 40 million metric tons. Manufacturing in the east increased sharply, so that the Urals alone were able to produce 40 per cent of Russia's total ordnance. The output of aluminum, copper, lead, magnesium, nickel, tin, tungsten and vanadium rose far above prewar levels. Several important railroad lines were constructed, especially to improve communications between Central Russia and the Caucasus, and between Central Russia and the new coal mines at arctic Vorkuta. Yet retrogression also took place in the deep rear. Excessive pumping and lack of drilling cut petroleum output by more than one-third. In addition, lack of maintenance reduced railroad capacity everywhere.

All in all, the Soviet Union emerged from World War II seriously weakened. True, some industries had risen above prewar levels, and coal had recovered to some 105 million metric tons, plus 45 million metric tons of lignite. Postwar territorial acquisitions covered other losses, such as those of population. But still other wounds were not easily healed. Railroad rolling stock totaled half of prewar numbers; steel output in 1945 was but 60 per cent that of 1940. Possibly a quarter of the entire national wealth of the USSR had been destroyed. Rehabilitation would require an enormous effort.

POSTWAR RECONSTRUCTION AND DEVELOPMENT—Less than a year after the end of the war, in March, 1946, the Soviet Union proclaimed a new Five-Year Plan of economic reconstruction and expansion. First priority was allocated to heavy industry and transportation. Nearly half of all the expenditures were to go to the reconstruction of devastated areas, while about one-sixth were to be concentrated on the railroads.

What have been the achievements of the Fourth Five-Year Plan to date? According to official Soviet statistics, published on January 18, 1950, industrial production, after a rise of 20 per cent in 1949 over 1948, had exceeded the 1940 level by 41 per cent, a rate of progress in excess of the Plan. Claimed productive increases for the period 1945 through 1949 have, however, been very different in differing parts of the national economy. The patterning of these dissimilar increases is instructive: least change has been claimed in the size of the non-agricultural labor force, a rise of 32 per cent since 1945, and 15 per cent greater than in 1940. Between 1945 and 1949, electrical power output is said to have risen by 74 per cent, while freight-car loadings increased by 43 per cent

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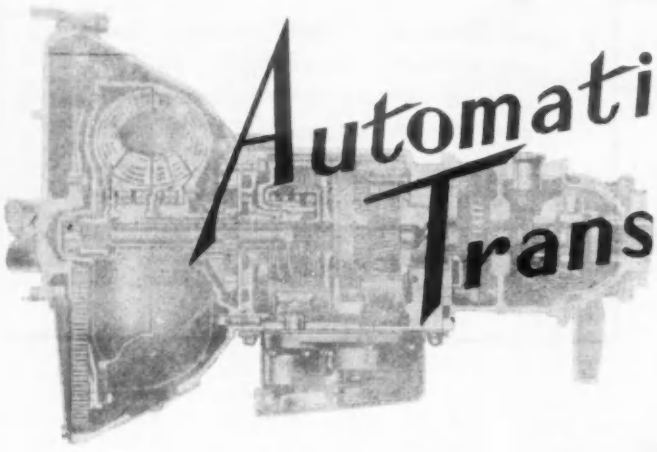

Automatic Transmissions

PART VIII

Part VII on the New Mercury-Ford Automatic Transmission Was Published in the June 15 Issue, Automotive Industries

BUICK'S Dynaflow which went into quantity production early in 1948 was the first transmission embodying a hydro-kinetic torque converter specially designed for use in passenger cars. There are two advantages inherent in the hydro-kinetic drive: extreme smoothness or flexibility, and ease of control, the latter resulting from the fact that the torque ratio changes automatically; and elimination of the need for clutch operation and gear shifting during most driving conditions.

One departure from previous torque-converter practice made by Buick in the Dynaflow was to keep down the stall-torque ratio of the converter and provide for abnormal driving conditions by combining the hydraulic unit with a mechanical two-speed-and-reverse gear. Another innovation, also designed to raise the efficiency, consisted in making both the impeller and the reactor in two parts, of which the part which the fluid enters first is free to run ahead of the other. These "entrance sections" are mounted on roller clutches, and when the direction of flow at the entrance is such that the fluid impinges against the rear of the vanes of one of these parts, the part begins to freewheel, thereby reducing the shock loss sustained at the entrance to that element of the converter.

A longitudinal section is shown in Fig. 1. First at the left may

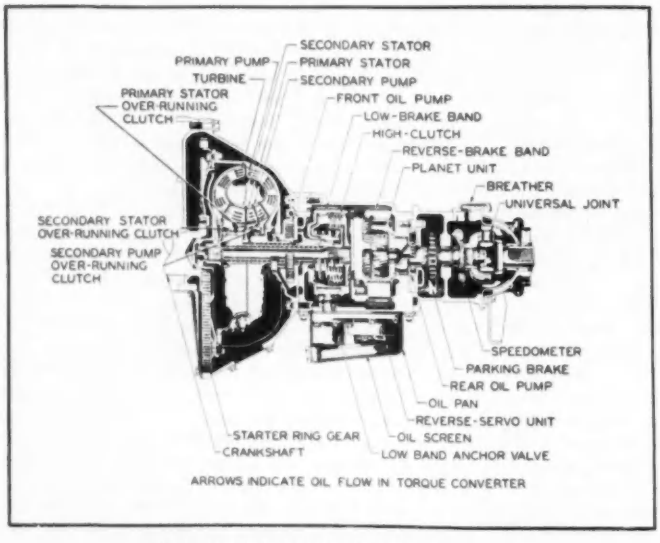

Fig. 1—Longitudinal section of Dynaflow transmission.

By P. M. Heldt

The Buick Dynaflow, First of Its Type for Passenger Car Use

be seen the hydraulic unit, which comprises five vaned rotors, three of them mounted on roller clutches. The main impeller (or what Buick calls the primary pump) is driven from the engine crankshaft through a flexible disk, which takes the place of the usual flywheel. Before the fluid reaches this primary pump it passes

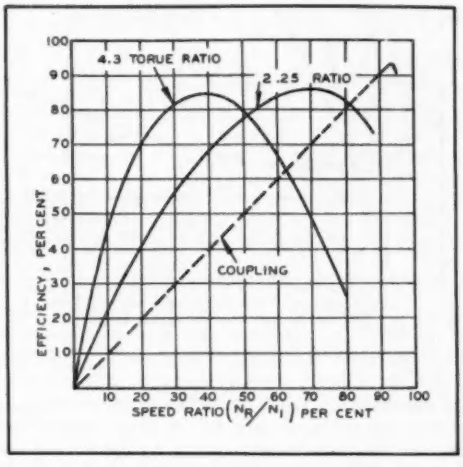

Fig. 2—Efficiency vs. speed ratio for converters with different stall-torque ratios.

through a secondary pump or auxiliary impeller, which latter is supported on the hub of the main impeller through a roller clutch. From the main impeller the fluid passes into the runner (or turbine), in which it flows toward the axis of rotation. The runner discharges the fluid into a two-part reactor. For convenience we will refer to these parts as reactor I and reactor II. Both are mounted on roller clutches, of which the stationary ring or race is secured to the transmission housing. These clutches allow the reactors to turn freely in the direction of impeller rotation whenever the direction of flow at their entrances tends to turn them in that direction, but prevent them from turning in the opposite direction.

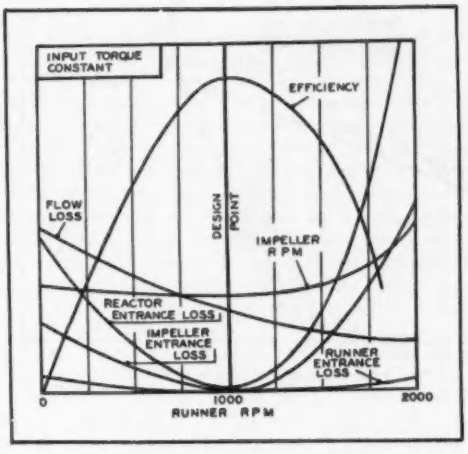

Fig. 3—Efficiency and items of converter loss plotted against runner speed, for a three-element converter.

Back of the hydraulic unit there is a two-speed-and-reverse planetary assembly with hydraulic control. Under normal driving conditions this assembly is locked, so that a direct drive through it is obtained. The low forward speed, which has a ratio of 1.82:1, is intended for use under two different conditions—when ascending long, steep grades, where in direct drive the hydraulic unit would have to operate in the high-torque-ratio, low-efficiency range, and when, in de-

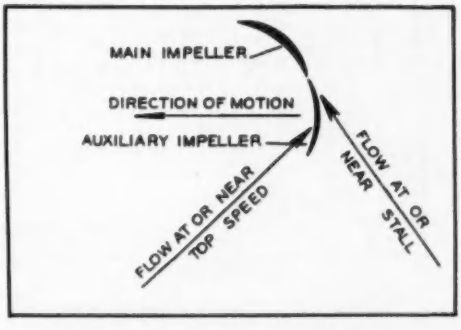

Fig. 4—Direction of flow relative to Dynaflow two-part impeller for different conditions of operation.

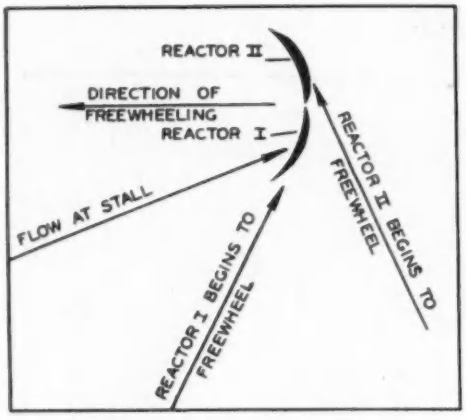

Fig. 5—Direction of flow relative to Dynaflow two-part reactor for different conditions of operation.

scending long, steep grades, it is desired to use the engine braking power to best advantage. Most of the gears of the planetary assembly are used for both the low forward speed and the reverse, and the assembly is very compact. All gears, moreover, are cut with helical teeth, and the planetary pinions are mounted on a rigid carrier, so they operate both efficiently and silently. Besides, these gears transmit power only when the car is being driven in either the emergency low or the reverse gear.

Back of the planetary unit there is a parking lock, consisting of a notched disk and a pawl adapted to engage into the notches. This brake, therefore, is of the positive-lock, rather than of the friction, type. In another compartment of the housing enclosing the parking lock are located the speedometer drive and the universal joint for the forward end of the propeller shaft.

It may be well to discuss first the effect of the low stall-torque ratio on the efficiency characteristic of

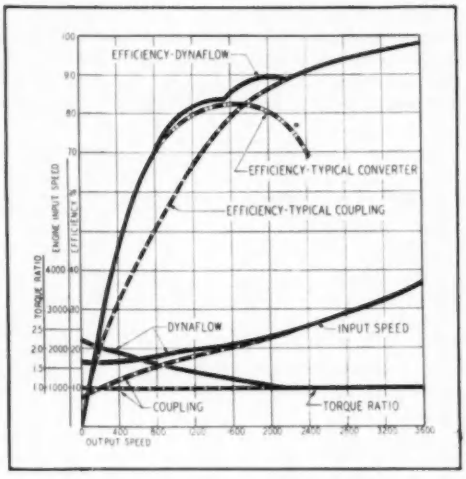

Fig. 7—Efficiency and torque ratio, etc., of Dynaflow, typical converter and typical coupling.

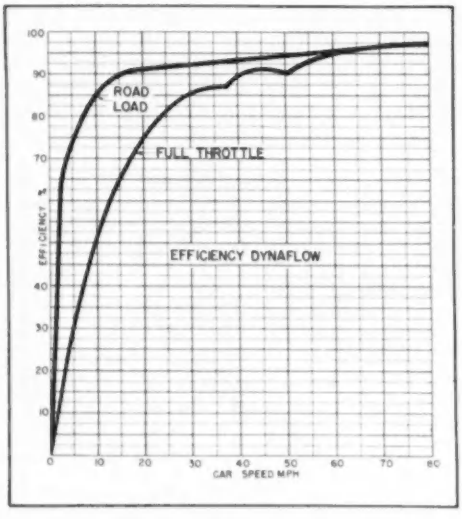

Fig. 6—Efficiency of Dynaflow at full throttle and at road load.

the converter. In Fig. 2 are shown curves of efficiency plotted against speed ratio of two three-element converters with stall-torque ratios of 4.3 and 2.25 respectively, the latter ratio being the same as that of the Dynaflow. It will be seen that there is no great difference between the maximum efficiencies of the two units, that of the low stall-torque ratio being perhaps 2 per cent higher. What is important is that in the case of the low stall-torque converter the efficiency reaches its maximum value at a considerably higher speed ratio, and if there is a change to coupling action (as in the Dynaflow), the efficiency at the changeover point, which is the minimum efficiency in the upper speed range, is much higher in the low- than in the high-torque converter. In a graph of this type the efficiency of the fluid coupling is represented by a straight, diagonal line, shown dashed in Fig. 2, and by making successive changes in the shape or inclination of the rotor vanes to reduce the stall-torque ratio,

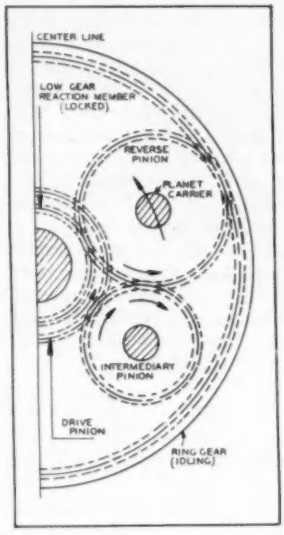

Fig. 8 — Diagram of planetary low-gear train.

a series of efficiency curves is obtained which approach the efficiency line of the coupling more and more.

Within the lower half of the speed range the efficiency of the low-torque converter is lower than that of the other. Provision of an emergency low gear in the Dynaflow makes it unnecessary to operate in this part of the converter speed range, except for short periods when starting from a standstill or when accelerating from a low speed under normal road conditions.

The instantaneous absolute motion of the fluid in a torque converter may be resolved into two components, the flow motion and the whirl motion. The flow or circulatory motion is produced by the centrifugal force engendered by impeller rotation. Under stall conditions this is the only force acting on the fluid, and for a given impeller speed the velocity of the flow motion is then a maximum. But as the runner begins to turn, it also produces a centrifugal force, which latter is opposed to that due to the impeller. The relations are much the same as in an electric motor, such as an engine starter motor. In the latter, when battery current is first turned on, the full electromotive force at the motor terminals is available for overcoming the resistance of the armature and field windings, and a heavy current flows. But as the armature begins to rotate, it generates a counter electromotive force, and the current then is proportional to the difference between the applied and the counter electromotive force. In the same way in the torque converter, as the runner gains speed, the counter centrifugal force generated by it increases, and with a constant impeller speed, and therefore a constant primary centrifugal force, the effective force causing circulation would decrease. However, in actual operation, under conditions of full engine load, the impeller speed is not constant, but increases with the speed of the runner. This, of course, tends to increase the flow rate, but the other effect, increase in the counter centrifugal force due to higher runner speed, predominates, and the flow rate decreases as the runner speed increases.

Effects of other improvements made by Buick in the converter-coupling unit may be best explained by reference to Fig. 3, which is based on one of the illustrations of an SAE paper by Oliver K. Kelley, and applies to an ordinary three-element converter. In a converter the flow losses vary as the square of the flow velocity, and the decrease of flow losses with an increase in runner speed is one of the converter characteristics plotted. The chart indicates that the flow losses at full speed are about 28.5 per cent those at stall, from which it would follow that the flow velocity at full speed is only about 53 per cent that at stall. These figures, of course, would apply only to a particular design.

Shock losses at the entrances to the various elements of the converter depend upon the angle which the direction of flow makes with the vane surface at the entrance, and it is therefore necessary to study the changes in the angles of entry into the various elements with the runner speed. We will first consider the entrance conditions at the impeller.

In the Dynaflow the vanes of the two impellers present a continuous concave surface to the fluid in the direction in which the impellers revolve. At stall, since the fluid leaves the runner with a high backward whirl velocity, it leaves the reactor and

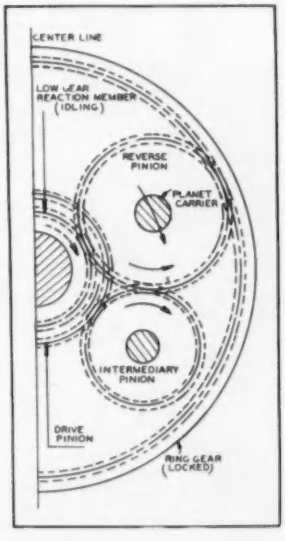

Fig. 9 — Diagram of planetary reverse gear train.

enters the impeller with a high forward whirl velocity. In fact, the velocity of the fluid at the impeller entrance is greater than that of the impeller itself, so that the fluid has a forward velocity relative to the impeller, and impinges against the back of the vane, as shown in Fig. 4. If both impellers were rigidly connected, such a large entrance angle as indicated in the diagram would involve a heavy shock loss. The variation with runner speed of the shock loss at the impeller entrance in an ordinary three-element converter is plotted in Fig. 3. The loss decreases from the stall point to the design point, at which latter the entrance angle vanishes, and then begins to rise again, attaining a much larger value at top speed than it had at the stall point. In the Dynaflow the auxiliary impeller freewheels over a certain speed range from the stall point up, and the effective entrance angle at stall, which is determined by the main impeller, is smaller. At top speed the effective entrance angle is determined by the auxiliary impeller, and also is smaller than it would be if a single impeller with vanes of suitable entrance angle were used. This means that impeller-entrance shock losses are reduced over practically the whole speed range. In a converter with impeller vanes concave on the forward side, the whirl velocity at the impeller exit is greater than the peripheral velocity of the impeller-vane tips.

Next the shock losses at the entrance to the reactor may be considered. At stall the fluid is discharged backward at great velocity by the runner, and impinges with great force against the forward, concave side of the reactor vanes. This involves heavy shock

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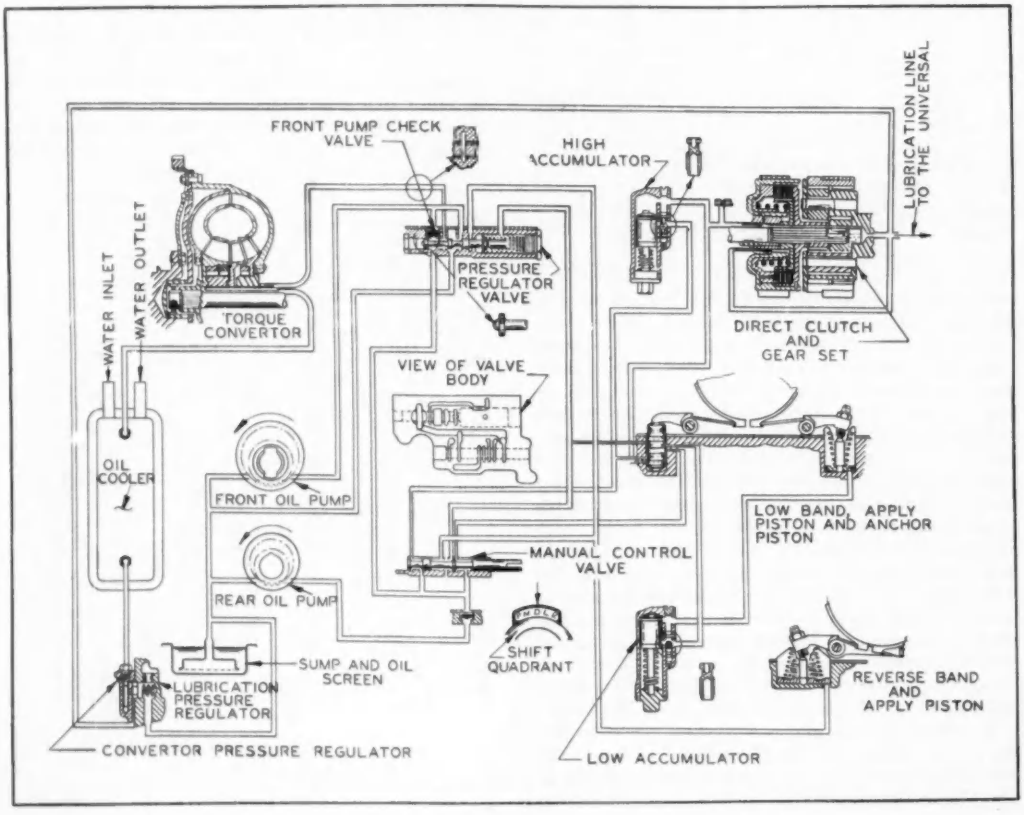
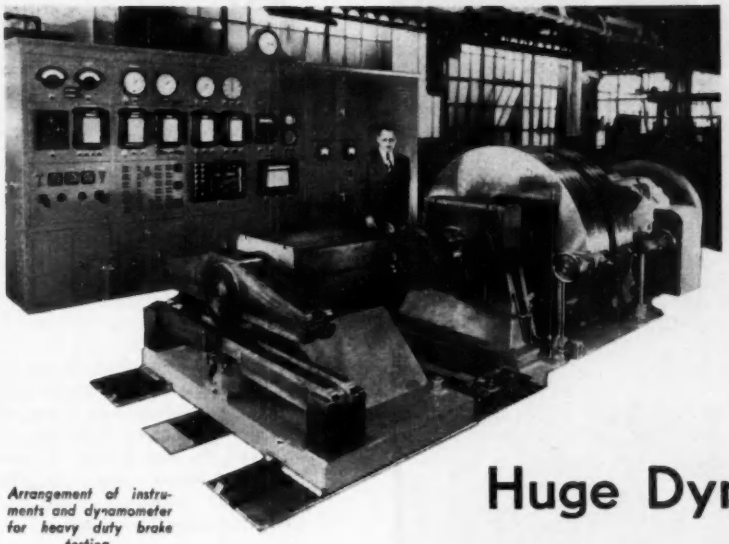
Fig. 10—Diagram of Dynaflow hydraulic control system. (Movable parts are shown in the positions they occupy when control lever is in D position and car is traveling at less than 45 mph).





Arrangement of instruments and dynamometer for heavy duty brake testing.

By
Joseph Geschelin

Huge Dynamometer Tests Heavy Duty Brakes

TO fill in a gap not covered by other laboratory equipment or by its extensive fleet of trucks and facilities available in customer properties, Raybestos - Manhattan, Inc., Passaic, N. J., has acquired an extremely large and versatile inertia brake testing dynamometer. Experience has shown that this type of machine best suits their requirements for investigating and measuring specific frictional and wearing characteristics of brake lining and brake blocks.

Research, development and production checking of the heavy-duty range of frictional materials require king-sized testing equipment having precise operational and control characteristics. Forces and loads must be infinitely variable and measurable. All of these requirements are met by the machine described here, which was built by Wm. R. Thropp & Sons Co. to designs of Raybestos-Manhattan.

The photograph at the top of the page shows a general perspective of the dynamometer and the instrument panel. The massive, clean lines are shown, as well as the arrangement of the various machine elements. The rotor is supported on two large, self-aligning roller bearings which are lubricated with circulating oil. The 350-hp motor is directly coupled and has only one bearing on its outer end. This results in an extremely short, rigid design with a low center of gravity.

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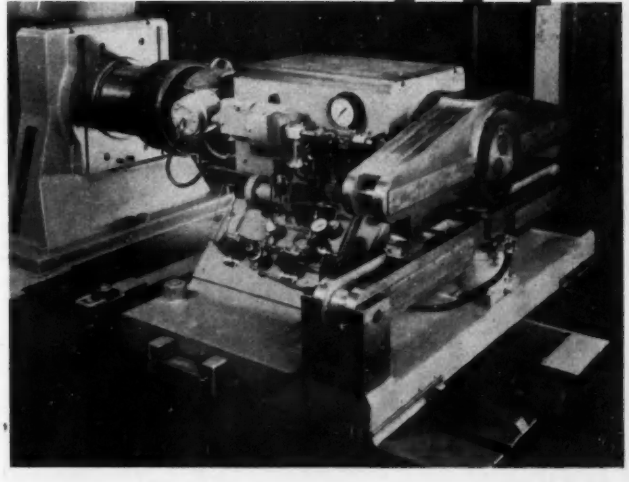

Shown here are the Uni-Tork valve, solenoid valves, brake input and output controls, power cluster, etc.

Chrome

By Joseph Geschelin

WHAT is said to be one of the first examples of chromium plating of stainless steel motor car grille assemblies is exemplified in the mass production setup recently placed in operation by Briggs Manufacturing Co. About a year ago such parts were finished with a high polish but without plating or coating and were lacking in brilliance and match with other decorative parts and moldings.

The operation, divided between two of the Briggs plants, starts at the Russell-Ferry plant. Here the 17-7 stainless steel strip is received from the mills, is unbundled, and passed through the initial polishing operation. This is done in a battery of six of the familiar Hill-Acme abrasive

1. *Here is the battery of six Hill-Acme abrasive polishing machines installed at the Briggs Russell-Ferry plant for polishing stainless steel strip. Washing and coating of strip is done in the units at the far left.*

2. *Grille sections are polished individually on a large automatic merry-go-round polishing machine, then finished by hand on the polishing jacks seen here.*

3. *Close-up at Briggs Eight-Mile plant showing press operations on stainless steel strip, forming it into grille sections. One of the new Danly presses is at the left, a Clearing press at the right.*

Plating Improves Stainless Steel Grilles

polishing machines. Strips are fed on a mechanized through conveyor having guiding rails at the loading station so as to properly align three strips in a row.

It is of interest that in this operation the polishing belts are run dry, except for a light spray of polishing compound on the work between units. Some impression of the character of finish produced by this equipment may be gained from the fact that surface finish is being held to less than three-micro-inches.

As the strip leaves the last unit, it enters a two-stage washer which may be seen at the extreme left in the illustration of the polishing machines. The work then continues through a set of coating rolls where the surface is given a film of water-soluble coating material designed specifically to protect the finely polished surfaces from scratches while going through the presses. The character of the coating is quite important. It is held to a thin film of uniform thickness by means of a controlled air blast at the exit end of the rolls. Next in line is a gas-fired oven for drying and curing the film.

Strips then are removed from the conveyor, rebundled to prevent damage in transit, and transported to the Briggs Eight-Mile plant for the remaining operations.

It may be noted at this point that although the battery of six Hill-Acme machines is new, the company had two larger machines in operation almost two years ago for pre-polishing large body sheets during the period of sheet metal shortages.

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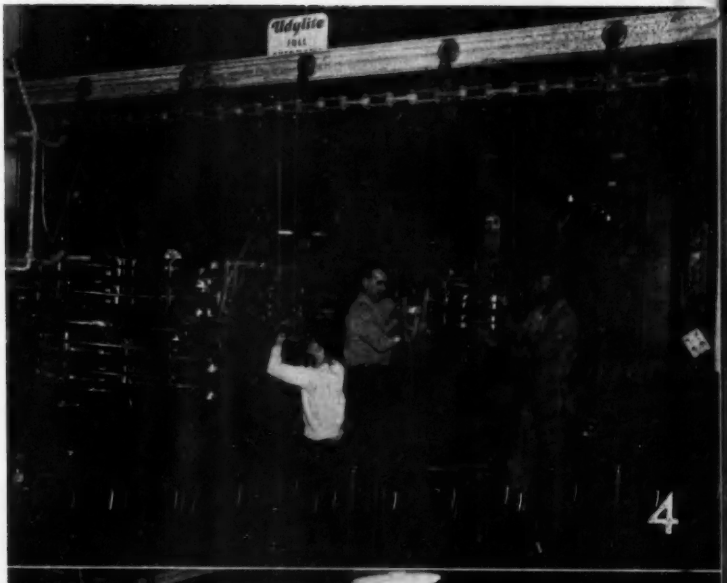

4. *Entrance to the enormous Udylite chromium plating unit at the Eight-Mile plant. Operators may be seen in the act of loading grilles onto the two anode fixtures, each one holding two grilles.*

5. *Grille assemblies are made up into integral units by welding in the fixtures shown in this view.*

Variety in Gear Production

By Joseph Geschelin

RECOGNIZED as a specialist in gear manufacture, Automotive Gear Works, Inc., Richmond, Ind., supplies a variety of gears and gear sets to manufacturers of farm equipment, motor trucks and buses, industrial equipment, and some passenger cars. The major items produced include—bevel gears, transmission countershaft gears, matched ring gear and pinion sets for hypoid drives and spiral bevel drives.

The company is well known as one of the earliest suppliers of quality flywheel ring gears, with experience dating back to 1926 when equipment for rolling bar stock into rings was non existent. Automotive designed and built its own roll-forming machine at the time and is still using the same design. Other machines and equipment, such as special chamfering machines and hardening furnaces to produce this highly specialized type of gear, also were designed and built in the plant.

A few years ago when the Cincinnati Flamatic machine became available for selective surface hardening, the company adopted the technique for hardening flywheel ring gear teeth, specifying a definite hardness pattern which leaves the mass of the ring completely soft and ductile. One of the early tests of this technique was to bend the ring flat or into pretzel form without causing fracture at any point.

According to the company, the advantages of Flamatic hardening of quality ring gears, include: hardening without distortion; the ability to hold ring gears to size without dimensional change; and the ductility of the ring mass, providing freedom from failure.

Flywheel ring gears are produced in a

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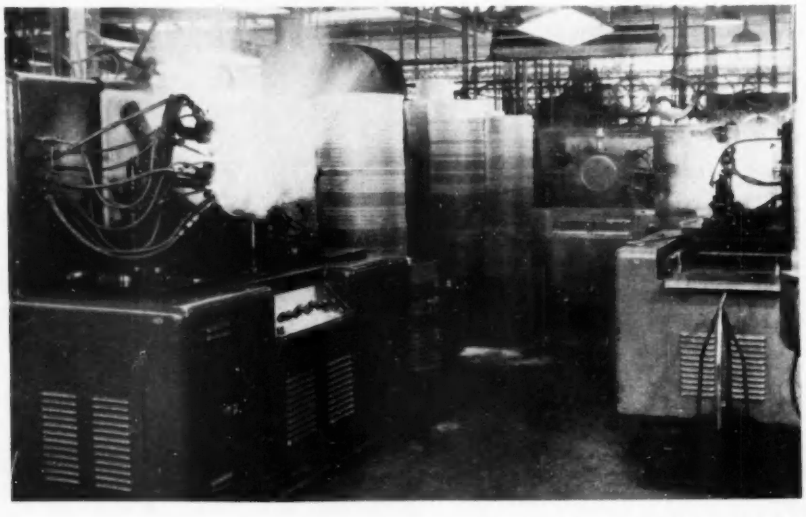
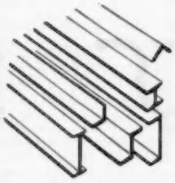


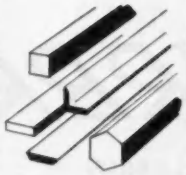
Here is a view of the battery of three Cincinnati Flamatic hardening machines for hardening flywheel ring gear teeth. The new machine for large rings may be seen at the left.

HOT AND COLD ROLLED SHEETS AND STRIP

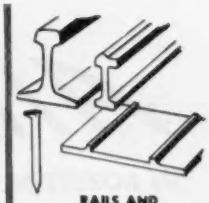


STRUCTURAL SHAPES

CARBON STEEL PLATES

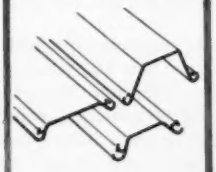


CARBON STEEL BARS

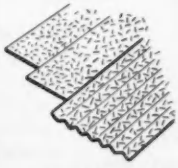


RAILS AND TRACK ACCESSORIES

HI-BOND* REINFORCING BARS

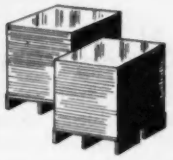


SHEET PILING



GALVANIZED SHEET PRODUCTS

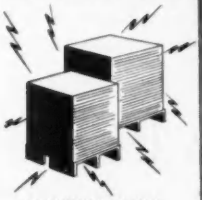
4-WAY* SAFETY PLATE



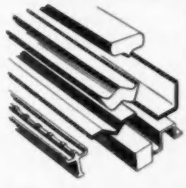
TIN MILL PRODUCTS

ENAMELING IRON AND TI-NAMEL* SHEETS

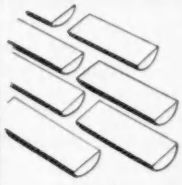
you can rely on INLAND for the RIGHT STEEL



ELECTRICAL SHEETS



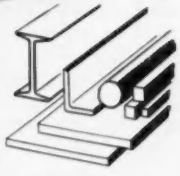
RAIL STEEL PRODUCTS



PIG IRON

LIMESTONE

COKE BY-PRODUCTS



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the men and mills of INLAND STEEL COMPANY are geared to serve the industrial heartland

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AIRBRIEFS

By ROBERT McLARREN

Emergency for Industry

If a national emergency did not exist, the aircraft manufacturing industry could rightly say: "I told you so" to administration leaders. For five years the industry has pled for a long-range procurement program, the Air Force has warned that 70 groups were a minimum need and two air policy groups—one appointed at the President's own request—have urged these measures and many others in addition. But Mr. Truman has steadfastly held to 48 groups, has impounded half-a-billion dollars in procurement funds and, through Secretary Johnson, has virtually scuttled Navy and Marine Air. Now that the heat is on, the story is quite different, and the industry must once again go through the tortuous dislocations and pressures of emergency expansion. Hundreds of speeches have warned that the "next war" would not be like the last one, but we think the facts are quite the opposite: that in the aircraft manufacturing phase, at least, it's the same old story all over again.

Two Times Four

The President's $10 billion emergency request for the Korean crisis contains $4,535,000,000 for the Air Force, of which about one-half is for aircraft procurement. This means that the current fiscal 1951 procurement program will be roughly doubled from its $2,298,600,000 total. In round figures the industry is being called upon to produce 5000 airplanes by next July. But industry leaders point out that a modern combat aircraft is about four times as difficult to produce as its World War II counterpart. This stems from its higher speed and, therefore, greater loads, but these must be carried in smaller envelopes, which means higher-strength materials and heavier structure. The proportion of electronic and highly-specialized equipment has increased enormously, all of which means more time, effort and expense in the production of modern combat airplanes. It means, briefly, that the industry must increase its efforts by two times four, or eight times its pre-Korean level of activity.

Go Ahead

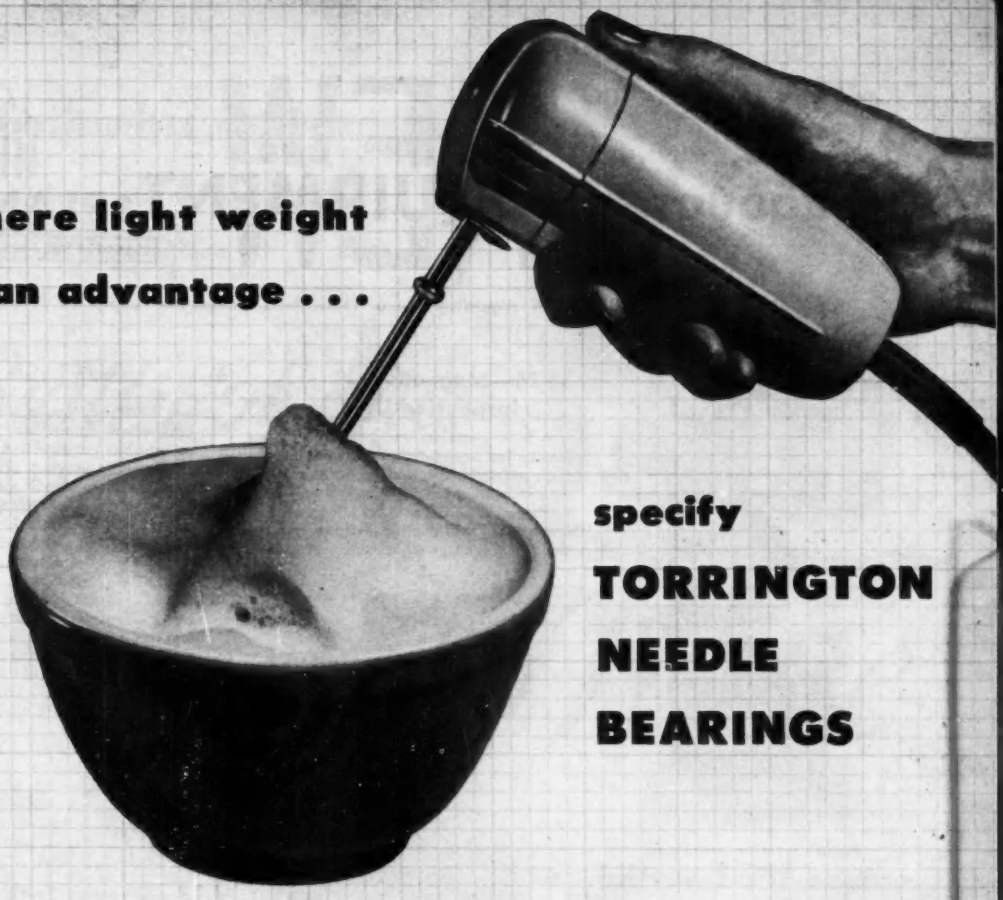
Air Force has already issued letters of intent to some 200 airframe, engine, propeller, accessory and equipment suppliers for doubling their current output based on the new $4.5 billion program. Contracts will follow at a later date. Thus, the new program is made up of simply increased quantities of those aircraft currently in production. This is the simplest and quickest way to step up production. The Lockheed F-80 Shooting Star, which has figured so prominently in Korea, went out of production in July but it is being replaced on the production line by the F-94A two-place all-weather fighter and the F-94B, an improved model, both using basic F-80 components and, production-wise, simply an extension of the F-80 line. The same situation obtains in the case of the Republic F-84F, a swept-wing version of the standard Thunderjet. Question-mark is the Convair B-36 bomber and USAF has given no indication whether expansion of its production is a part of the new program. If the new plan is based on Korean experience and requirements, certainly no additional B-36's will be ordered, but it is apparent that increased aircraft production must be based on world-wide requirements and not on the demands of a single theater.

Combat Money's Worth

Granted that current aircraft are four times as complex as their World War II sisters, how do they compare in effectiveness? In the bomber category, the Boeing B-29 Superfort is now the standard medium bomber and this means that unit bomb tonnage capacity is doubled over the Boeing B-17 and Convair B-24 of World War II. Range is up substantially so that ton-miles are about quadrupled in the bomber category and that represents a solid gain in the bomber department. But the emergence of the jet fighter to the complete exclusion of the piston-engine fighter is cause for concern. As is well known, the F-80 in Korea has a tactical radius of about 350 miles, which includes about 15 minutes of combat. The World War II fighter, in contrast, had a tactical radius of about 750 miles. These missions, however, consist simply of flying to the target, engaging enemy aircraft and flying home. The World War II fighter, such as the North American Mustang, on the other hand, could patrol on station for as long as three hours, something the jet fighter cannot do at all. As a result we have simply bought speed with our post-war progress and

(*Turn to page* 90, *please*)

where light weight is an advantage . . .



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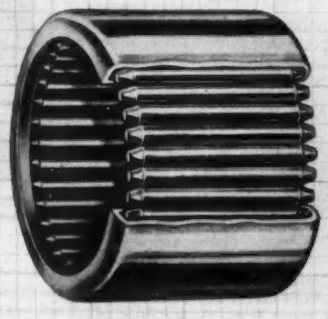

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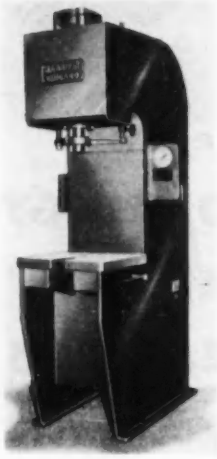


Hannifin hydraulic forcing press, Model F-101

M-25—Hydraulic Forcing Press

Almost immediate delivery at two-thirds the price of a conventional model is offered on the new 10-ton hydraulic forcing press, Model F-101, put out in simplified design for quantity production by Hannifin Corp., Chicago, Ill.

The F-101 is floor mounted, with an 18-in. by 20-in. table 36 in. above the floor. Standard models have a 3-in. "U" slot in the table. Gap or "daylight" is 22 in.; reach 10 in.; and maximum stroke 12 in. Completely self-contained, with a 5 hp vertical motor and an 11 gpm constant volume pump, the press has an adjustable relief valve which makes it possible to set maximum pressure at any point from 10 per cent of capacity to full, 10-ton capacity. The ram is guided to prevent rotation and return stroke is adjustable so cycle time can be reduced considerably on applications where the full stroke is not needed.

Single manual lever control—"handle down, ram down; handle released, ram up"—is standard, but dual manual lever control and Hannifin's sensitive pressure control are both available. Also available is a differential circuit which doubles approach speed without limiting feed pressure or return speed.

M-26—Magnaflux Inspection Unit

A new, portable, and general purpose Magnaflux unit for maintenance inspection, safety inspection, general inspection is announced by Magnaflux Corp., Chicago, Ill. With Magnaflux, all defects such as invisible fatigue cracks, shrink cracks, weld cracks, etc., are made readily visible by a magnetic particle indication built up on them by quick magnetization.

Magnaflux portable unit for magnetic particle inspection, Model KH-05

This KH-05 Magnaflux unit requires only 110 volt AC supply line to give AC or DC magnetization with safety and flexibility, using low voltage, high amperage magnetizing currents. 500 magnetizing amps are available. The AC magnetization is best for location of all surface defects such as service fatigue cracks in tools or shafts, and the AC furnishes a powerful demagnetizing field whenever needed. The half-wave rectified DC has been developed for location of sub-surface defects such as internal cracks in welds, and for cracks on the inner surface of cylindrical parts.

Three Eitherend connector outlets on the unit allow connection to two for AC, or another combination of two for DC magnetizing current. All operation is controlled by a single switch on an inclined control panel, which also carries a meter that reads in true magnetizing amps, and a red indicator light that shows when magnetizing current is available in the cable.

Using an accessory prod kit, magnetizing current is available at a pair of hand grip prods, to complete the full magnetization flexibility often required when complex castings, welds and other parts need current passed through them for best magnetization to find all defects.

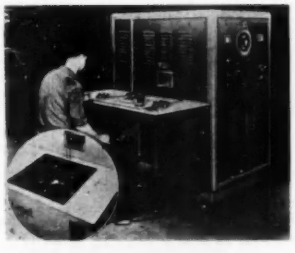
Magnaflux Corporation's most sensitive magnetic particle inspection development, Magnaglo, can also be used with this KH-05 unit. A magnaglo kit is available as an accessory.

M-27—Quench Tank and Table Combination

A combination work table and quench tank, attached to their vacuum tube or spark gap converters, has been designed by Lepel High Frequency Laboratories, Inc., New York, N. Y.

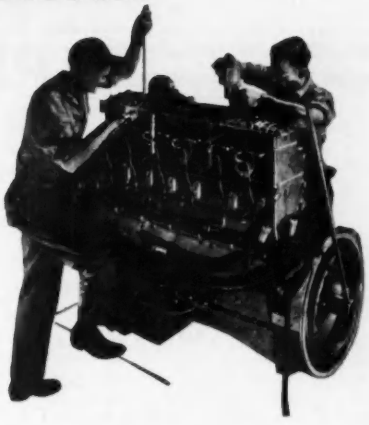
With the sink cover on, this combination unit forms a handy work table 29 in. by 56 in. for mounting work coils and fixtures. The center portion

(*Turn to page 76, please*)



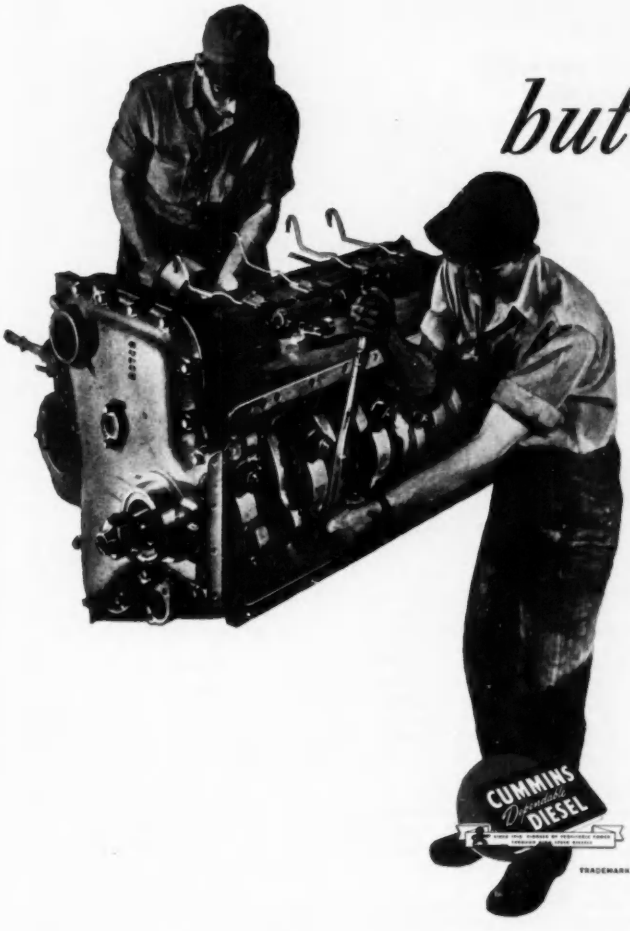
Lepel high frequency converter with combination work table and quench tank attached. In the inset the cover is removed showing sink with Lepel Roto heating and quenching unit

Cummins® Custom-built Diesels



Built not once

but Twice



The better-built engine for more profitable power

Yes, they're actually built *twice*. That's what makes a lightweight, high-speed Cummins Diesel such an efficient, dependable, precision-made engine. After initial assembly, each engine is run-in on the test block. Then it is torn down and carefully re-inspected—after that it is re-assembled and tested *again* to assure *peak performance*.

The finest of engine craftsmanship . . . exclusive Cummins fuel system . . . engines that are "custom-built to fit the job" . . . make a Cummins Diesel a *better buy for your power needs.*

Contact your Cummins dealer. He has more facts to show you about making more profits with

Diesel power by CUMMINS

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Lightweight High-speed Diesel Engines (50-350 hp) for: On-highway trucks · off-highway trucks · buses · tractors · earth-movers · shovels · cranes · industrial locomotives · air compressors logging yarders and loaders · drilling rigs · centrifugal pumps generator sets and power units · work boats and pleasure craft.

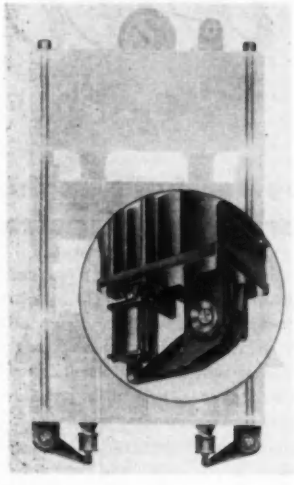
NEW PRODUCTS

FOR ADDITIONAL INFORMATION regarding any of these items, please use coupon on PAGE 58

P-34—Overload Safety Device

Approaching the problem of overload safety in large mechanical presses with a device called Loadtrol, Clearing Machine Corp. of Chicago, Ill., announces that when so specified, Clearing presses now in manufacture will include this device.

The Loadtrol unit is applied to one end (usually the bottom) of each tie rod. It consists of an air cylinder connected by a lever arm through an eccentric pin arrangement in such a way that the tie rod moves a short distance when a predetermined pressure is exceeded. This movement also disengages the clutch by means of an electrical control.



Clearing overload safety device for mechanical presses, the Loadtrol

In addition to protection against overload damage, Loadtrol permits preloading the tie rods cold in a matter of minutes the company points out. Since the yielding pressure can be adjusted as required, tryouts and settings of dies are said to be greatly simplified. When small dies are used, calling for less than full press capacity, the Loadtrol can be set accordingly to prevent damage to dies.

A modification of the same device is offered for protecting the links on the outer slide of a double action press. For this purpose Loadtrol units are mounted on the outer slide connections.

P-35—Bench Model Grinder

For free-hand grinding of castings, forgings, stampings, plastics, etc., where little stock removal is required. Charles H. Besley & Co., Beloit, Wis., has produced a small, inexpensive bench model grinder for light work. Designated as No. 318-18 in., this new vertical spindle grinder has an approximate weight of only 575 lbs, complete with its 18 in. diam abrasive wheel. Only 31 in. high and 28½ in. wide overall, the grinder can be installed on a stand of suitable height if facilities for bench mounting are lacking.

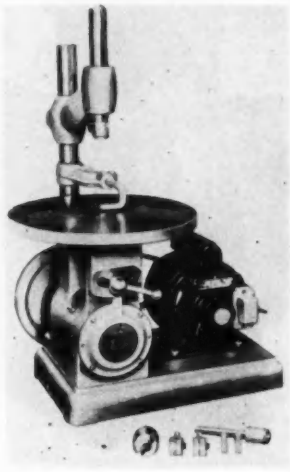
Besly bench model grinder, No. 318-18 in.

The grinder is designed around a Fairbanks-Morse axial air gap motor, a compact "pancake" type power unit. The 3-phase, 60-cycle motor is totally enclosed, fan cooled and ball bearing; 5 hp at 1160 rpm.

As all grinding is done in the horizontal plane, easier handling is claimed as well as increased production and safer operation. Dressing of the abrasive disk is accomplished by removing a section in the guard rail and swinging the dresser arm across the face of the abrasive. Crossarm, pedestal, motor driven coolant pump, tank, and piping for wet grinding are optional equipment.

P-36—Die Filing Machine

A new, improved die filing machine available from Illinois Tool Works, Chicago, Ill., increases ease of operation as to the chucking arrangement for files, saws and stones and provides an improved lubrication system. Chief utility of the machine is for fast, precise machine filing of intricate die contours, completely eliminating tedious hand filing while improving the finished product accuracy.



Illinois die filing machine for precise machine filing of intricate die contours

The machine operates on 110 volt, 60-cycle alternating current, or other power supply specifications. Standard operating speed is 375 to 500 strokes per min. Speeds as low as 250 strokes per min and as high as 650 strokes per min, achieved with special alterations, assure maximum cutting efficiency in nearly every type material.

(*Turn to page 64, please*)

Precision cast for quality
Sealed Power
PISTON RINGS · PISTONS
CYLINDER SLEEVES

Publications AVAILABLE

New Industrial Literature listed in this department is obtainable by subscribers through the Editorial Department of AUTOMOTIVE INDUSTRIES. In making requests please be sure to give the NUMBER of the item concerning the publication desired, your name and address, company connection and title.

L-38 Automatic Drilling and Tapping Machines

The Hartford Special Machinery Co.—Announcement has been made of the publication of a new bulletin, No. D-100, containing information on the company's line of automatic drilling and tapping machines. The bulletin is illustrated with blueprints, production rates and other data are given.

L-39 Materials Handling Equipment

Lift Trucks Incorporated—Two new bulletins on hand lift trucks have been issued. The bulletin on "Red Arrow" single stroke mechanical lift trucks covers six models. The folder on "hydromatic" fluid ram lift trucks also covers six models. In each folder specifications, dimensions, capacities and outstanding mechanical details are included.

L-40 Fire Detectors

Fireye Corp.—Two new bulletins have been announced. A preliminary bulletin contains technical information on the Fireye Protection System. Included in the bulletin is maintenance information, safety features, photographs of the detector and control panel, etc. The second bulletin, an attractive 2-color book gives performance and operation data, technical information, detail specifications, installation data and shows drawings of the detectors, and drawings showing the Fireye installations on Jet and Reciprocating engine aircraft.

L-41 Slitting and Slotting Saws

The Motch & Merryweather Machinery Co.—Manual No. 240 is the first edition of the company's Circular Sawing Handbook. It contains information in the form of tables covering the selection of saw blades, the operating speeds and feeds and tooth angles for sawing ferrous and non-ferrous materials. Information on the operation of circular sawing machines is included. The Handbook is divided into two sections, 1) description of circular sawing of materials, 2) slitting and slotting operations.

L-42 Cast-To-Shape Steels

Jessop Steel Co.—"Jessop Cast-To-Shape Steels" is the title of a revised catalog issued by the company. It illustrates and describes castings made from tool steels, stainless steels, and heat resisting steels.

L-43 Corrosion Resistant Paint

The U. S. Stoneware Co.—The facts about Tygon Paint are presented in a new bulletin. It tells where and how to use Tygon paint, and where not to use it. Corrosion resistant tables are included in the bulletin.

L-44 Air Operated Devices

Mead Specialties Co.—An attractive 2-color catalog, presenting Mead Air Operated Devices, is available. Described and illustrated in the catalog are air presses, collets, drill press feeds, heavy duty impact hammers, hand valves, speed control valves, foot valves, air vises, etc. Descriptions, diagrammatic drawings of the various models, tables of sizes and styles are given and a list of air line accessories.

(*Turn to page 60, please*)

TIME SAVER COUPON

THIS TIME SAVER COUPON is for your convenience in obtaining, WITHOUT OBLIGATION, more information on any one or more of the publications described above OR New Production and Plant Equipment OR New Products items described on other pages.

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NYLON PLASTIC sheds new light on auto interiors

LENSES OF MOLDED NYLON ARE ECONOMICAL . . . FLEXIBLE . . . HEAT-RESISTANT . . . VIRTUALLY UNBREAKABLE

A number of new automobile models are using nylon lenses for overhead interior lamps. This application makes good use of many of the outstanding characteristics that have won nylon plastic such high praise among parts manufacturers.

Nylon's toughness and its ability to be molded in very thin sections mean that lenses of nylon only 0.025 inch thick can withstand rough treatment in both assembly and service. Their flexibility permits them to be snapped in place easily . . . without use of gaskets required for lenses made of more rigid materials. Reduced breakage during assembly . . . the fact that only thin sections of nylon are necessary . . . simplified installation . . . all add up to substantial savings in production costs. And, extremely important for this application, nylon withstands heat from the lamp and will not yellow with age.

There are many other uses for nylon plastic in the automotive industry—bearings, gaskets, electrical parts, valve seats, gears. Among the unusual properties that make nylon plastic particularly suitable for these applications is its resistance to chemicals, abrasion, fatigue and permanent distortion. Nylon is quiet—permits close mating without chatter, and has good bearing characteristics.

Nylon plastic may be just what you need to help cut costs and improve the performance of a standard automotive part, or develop an interesting new one. For more information write to E. I. du Pont de Nemours & Co. (Inc.), Polychemicals Department, Sales Offices: General Motors Bldg., Detroit 2, Mich.; 350 Fifth Avenue, New York 1, N. Y.; 7 S. Dearborn St., Chicago 3, Ill.; 845 E. 60th St., Los Angeles 1, Calif.

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REG. U. S. PAT. OFF.
PLASTICS
Better Things for Better Living
. . . through Chemistry

(*Continued from page 58*)

L-45 Drill Press

South Bend Lathe Works—Bulletin No. 402 tells about the company's new "Economy Model" Bench and Floor type drill presses. The 4-page 2-color bulletin contains complete specifications of the new drill presses and gives prices and a list of attachments and accessories.

L-46 Radiators and Cores

General Radiator Co.—An illustrated booklet showing a number of different types of equipment using heat transfer products made by the company is available. Industrial engines, tractors, motor coaches, power shovels and cranes are among the items illustrated. Some of the features of the heat transfer products are also listed in the booklet.

L-47 Concentric Shaft Speed Reducer

The Falk Corp.—Engineering Bulletin No. 1105 provides information on service factors, dimensions, rating tables, method of selection, etc.

L-48 Hydro-Broach Machines

Cincinnati Milling and Grinding Machines, Inc.—Catalog M-1706 describes and illustrates the No. 1-30 Vertical Single Ram and Duplex (double ram) Hydro-Broach Machines. The catalog contains general specifications, dimensional drawings, a list of standard equipment and a list of extra equipment.

L-49 Chemical Construction Materials

The Atlas Mineral Products Co.—Announcement of the publication of their new general bulletin MCC No. 1 has been made. The bulletin describes briefly the company's complete line of chemical construction materials, including corrosion-proof linings, corrosion-proof cements, acid-proof brick and tile, corrosion-proof protective coatings, etc. Handy estimating data is also given.

Perhaps You Too Can Reduce Costs with a...

Lamb Electric special application MOTOR

A number of companies have found that a Lamb Electric Motor—engineered for their particular application — enabled them to reduce product costs. Other advantages:

IN THE MOTOR —

1. Reduced weight, space.
2. Exact mechanical and electrical characteristics.
3. Thorough dependability.

IN THE PRODUCT —

4. Better performance.
5. Improved eye-appeal.
6. Compactness, less weight.

Our 35 years' experience, covering practically every type of small motor-driven product, is available to help you obtain these results. *The Lamb Electric Company, Kent, Ohio.*

This small sturdy motor can be readily adapted to a wide range of industrial applications.

This motor is used extensively on such products as: industrial vacuum cleaners, agitators, sirens, and colloid mills.

They're Going into America's *Finest* Products

Lamb Electric SPECIAL APPLICATION FRACTIONAL HORSEPOWER MOTORS

Producibility

(*Continued from page 35*)

slight error is multiplied by the arm length.

The location of main attach and mating holes should be determined in the initial planning with tooling representatives. It has been found that it is often advisable to show these holes in the final assembly positions because their drilling in subassembly stations will usually cause misalignment in the completed assembly.

Due to loading revisions during the life of the production run, several breakdown considerations bear notation. The spar webs should be so mounted to the caps that thicker gage webs will not affect airfoil contour. (See Fig. 3.) Also while negligible edge distances appear to be the lightest design, some consideration must be given to load increases and future salvage action requirements. Minimum edge distances should be carefuly assessed, for the designer may eventually be faced with the realism of more and larger rivets, doublers and all the other bric-a-brac that comes with rework.

Mating parts must not be dimensioned on separate drawings but only on one with match notes on the others, for varying information in several places logically leads to considerable confusion. This applies to other sections of the airframe as well as the wing. Salvage rework and parts scrappage can be cut down by follow-up on other drawings affected when making a change.

Many replaceable panels connected by the multiple screw method are found in wings and empennage construction as well as in the body. Progressive tolerances build up over a long row of close tolerance screw holes and can result in misalignment over the last part of the group. The use of a common master for the drilling jigs is the

DUREX-100 ENGINE BEARINGS

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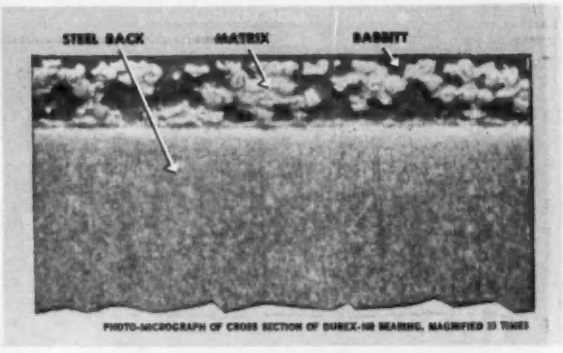

PHOTO-MICROGRAPH OF CROSS SECTION OF DUREX-100 BEARING, MAGNIFIED 25 TIMES

THE MATRIX MAKES THE DIFFERENCE

Steel-backed intermediate matrix of porous copper-nickel bonds mechanically, as well as metallurgically with thin high lead babbitt overlay.

More and more, as engines go to higher and higher compression ratios—and higher bearing loads—Durex-100 bearings are proving their extra ability to stand up on the job. This extra endurance, combining extraordinary conformability, embedability, and resistance to corrosion and fatigue cracking, is built into the bearing—layer by layer. To the steel back is sintered a layer of copper-nickel powders, which form a porous matrix firmly brazed to the steel. Then a thin overlay is cast of a special corrosion-resistant high-lead babbitt, which penetrates the porous matrix and bonds mechanically, as well as metallurgically, to the steel-backed matrix.

Durex-100 engine bearings, as original equipment in Cadillac, Buick, Oldsmobile, and GMC, and other automobiles and trucks, are proving their superior fitness for use in the modern high-compression engine. Inquiries are invited regarding the advantages of Durex-100 bearings for engines of your manufacture.

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DUREX-100 ENGINE BEARINGS . . . BY MORAINE

usual method for aligning the holes. In the case of a screw-mounted door it is advisable to segregate one hole for indexing so that the door will attach in only one way. This allows the tooling to be made for matching this one combination instead of for all the combinations which would result from equally spaced screw holes in all directions. (See Fig. 4.)

Canted ribs and frames complicate the efforts of all departments and have an adverse effect upon producibility. The curved intersection lines formed with the skin makes layout, coordination and attachment very difficult. Angular interrelations between mating members and assemblies should be kept as simple as possible.

The field service joint at the split line of any jet airplane's fuselage, simple though it appears, can be the source of considerable manufacturing and service difficulty. Since this is such a basic part of the fuselage design, its original layout, once adopted, is often a fixed part of tthe airplane's production life. At the time of its incorporation mating fittings secured by a special shear bolt appeared to be the lightest and simplest configuration and have been adopted generally. Experience has shown, however, that the strain relief in the structure when removed from a jig as well as tolerance build-ups being concentrated into the four attach points often result in misalignments at the joint. Special bolts and bushings have had a high mortality as a consequence. As a result better methods of attachment, which permit a more allowable adjustment, have been designed. Such a design sometimes incorporates a tension connection not unlike a hose fitting joint in principle. In either case pins are required around the butting frames for shear and torsion transmittal.

Bolt angle joints serve readily as manufacturing and field service breaks, for the tooling is simple, the interchangeability is satisfactory, and the weight penalty, considering the result, is small. Tooling provides a single master for such an arrangement and the shop merely drills in opposite directions for the two sections involved. A refinement of the manufacturing joint which works for ease of tooling in later assembly stages is the use of mating butt fittings across the joint for holding purposes until the skins can be joined for completion of the strength requirements.

In larger airplanes large sections can be fabricated with no other holding points in the jig than a few tooling holes and location arms to which to face the sheet formers or frames. This type section allows some adjustment when brought up for assembly to the remainder of the airframe.

Nesting of formed sheet metal parts should be avoided in any section of the airframe because of the variations in such forming. Nesting is equivalent to a close tolerance joint over some area and close tolerance fits in any joint should be kept to a minimum.

One logical method of eliminating assembly problems in the simpler groups of parts is to eliminate the assembly, that is make one part out of the several. This is what is done when long wing skin panels are designed in one piece, and what might be done if the channel assembly of Fig. 5, for example, were made of a taper milled sheet. The use of electroforming as a manufacturing process eliminates the joining of parts by welding or brazing. More and more it will be possible to simplify assemblies by the reduction of the number of parts due to new processes. But in the interim, and in the case of most assemblies in the breakdown, ingenuity and common sense plus experience are going to be the factors contributing most to producibility.

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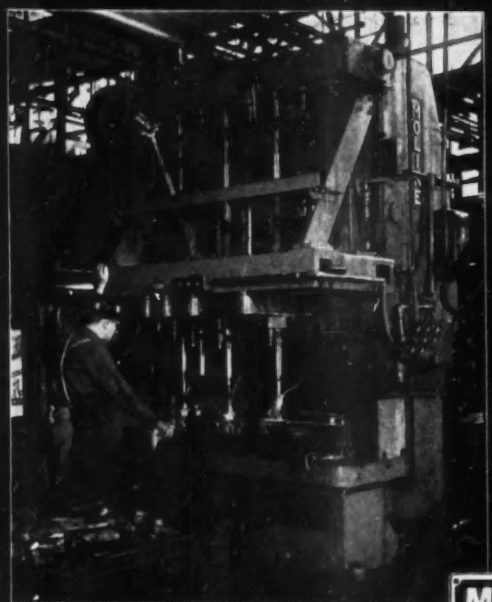

MODEL HU66 universal joint type driller performing core drilling, reaming and facing operation on forged steel parts

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In this oil burner nozzle lead, EASY-FLO 45 joins a steel tube and a copper tube to the brass forging at left. Steel tube is inside the copper tube. Both joints are induction brazed simultaneously, two assemblies at a time in 38 seconds.

It has always been our aim to help *every* user of our EASY-FLO and SIL-FOS alloys get the fullest benefit of the speed and low cost these low-temperature silver brazing alloys bring to metal joining. So, follow up is routine—and very often our men are able to come up with constructive suggestions.

For example—a user was brazing a small steel tube and a larger copper tube to a brass forging to make the oil burner part shown. He was using two rings of 1/16" EASY-FLO 45 wire, one for each joint—and he was perfectly happy with results.

Looking in on the job our man felt that more alloy was being used than was needed. So he got some of the parts and sent them back to our research lab. There it was found that rings of 1/32" and 3/64" wire for the steel and copper tubes respectively, were ample. Naturally, the change was made—and the saving in cost from this little reduction in the size of alloy wire has mounted to sizable proportions.

CAN YOUR BRAZING COSTS BE CUT?

Whether or not you are now using EASY-FLO and SIL-FOS alloys, we'll be glad to send a field engineer to give you the answer—without obligating you in any way. Just write or call and say when.

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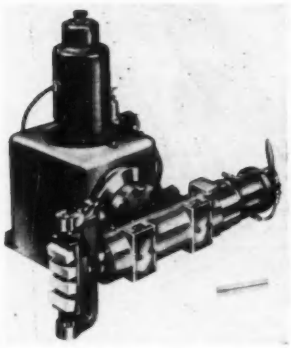
(*Continued from page 56*)

P-37—Superfinishing Attachment

The largest in the line of five sizes of superfinishing attachments announced by the Gisholt Machine Co. of Madison, Wis., is designated as the "No. 4" and is used for either cylindrical or flat work wherever large areas are to be covered.

This heavy-duty attachment is mounted on an engine lathe or other equipment now in the user's shop, and as traversed along the work, the superfinishing stones contact the surface and scrub away the amorphous metal. The attachment may be used on either ground or machined surfaces, although the working time is considerably longer when the surface has not been previously ground.



Gisholt superfinishing attachment, No. 4

The attachment can give up to 1000 psi pressure with an adjustable oscillation rate of from 42 to 250 strokes per min. One to four stones up to 1 in. by 1 in. by 6 in. can be mounted in the quick-change stoneholder. The complete unit is arranged for 220 volt, single phase, 60 cycle AC or DC current.

P-38—Colloidal Cleaning Compound

Introduced by the Misol Co., Detroit, Mich., division of Tool Associates and Instruments Co., a new type of cleaning compound known as Basol "77" Crystals acts on the colloidal principle, and by holding the grease in suspension, minimizes the scum that usually forms on the surface of a solution. Very finely dispersed in solution, it has great power to emulsify and disperse dirt, grease, oil, carbon, paint, tars, waxes, resinous matter, etc., and is said to have exceptionally long life when in continuous use. A non-caustic, non-abrasive and non-corrosive type of cleaner, it is also non-inflammable, harmless in transit and in use, and does not deteriorate in storege. Additionally, obnoxious odors and fumes are not present.

Basol "77" Crystals are used in conventional types of immersion tanks, jet or spray machines and require no conversion of equipment for their successful use. Industrial installations made so far in the Detroit area are said to report excellent results in metal cleaning and paint stripping.

(*Turn to page 68, please*)

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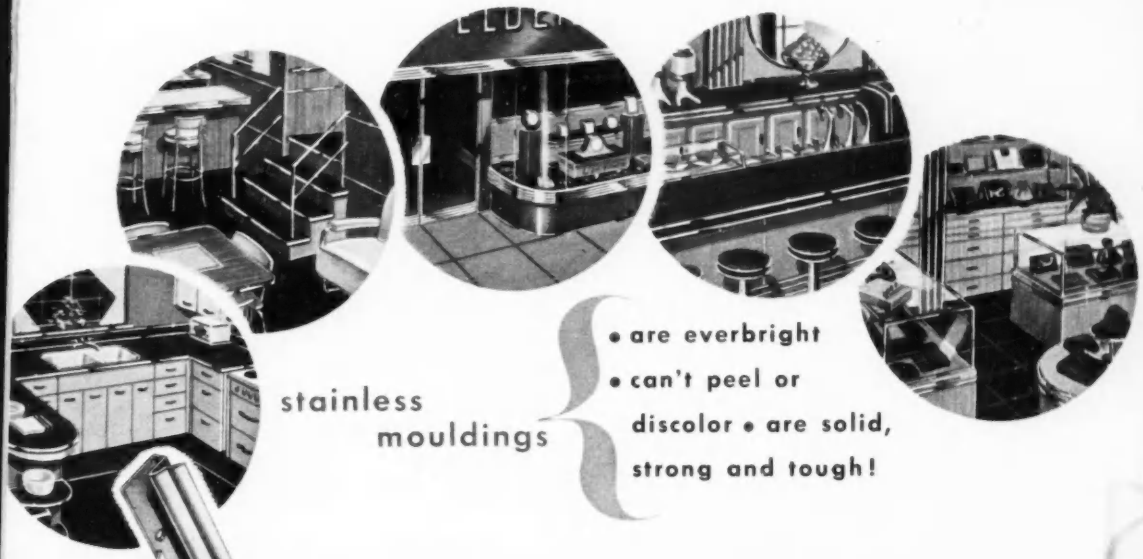

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Business in Brief

Written by the Guaranty Trust Co., New York, Exclusively for AUTOMOTIVE INDUSTRIES.

General business activity continued at a high level during the week ended July 22. Increases were reported in department store sales, electric power production, bituminous coal production, crude oil output, and railway freight loadings, while construction declined. The *New York Times* index of activity for the period stands at 160.8, as compared with the postwar record of 162.4 attained in the preceding week and 137.4 a year ago.

The dollar value of department store sales in the week ended July 22, as reported by the Federal Reserve Board, was equal to 302 per cent of the 1935-39 average, as compared with 265 in the week before. At this level, the value of sales was 46 per cent more than in the comparable week of last year. The total reported since the beginning of the year was one per cent more than the corresponding sum in 1949.

Electric power production rose during the same period. At 6186 million kilowatt hours, total output was 13.3 per cent above the amount a year earlier, as compared with an advance of 12.4 per cent shown in the preceding week.

Production of bituminous coal and lignite for the period is estimated at 11,205,000 net tons, 2,090,000 more than the output in the week before and 3,927,000 above the corresponding amount in 1949.

Crude oil output in the week ended July 23 averaged 5,537,500 barrels daily, 42,050 more than in the preceding week and 798,700 above the production in the comparable period of last year.

Railway freight loadings during the week ended July 22 totaled 829,884 cars, 5.1 per cent more than the figure for the week before and 15.5 per cent more than the comparable number recorded a year ago.

Civil engineering construction volume reported for the five-day week ended July 28, according to *Engineering News-Record*, was $252,489,000, or 19 per cent above the average to date this year, while the total recorded since the beginning of the year is 50 per cent more than that in the similar period of 1949.

The wholesale price index of the Bureau of Labor Statistics during the week ended July 25, at 163.7 of the 1925 average, was 0.2 per cent higher than in the preceding week and 7.0 per cent above the corresponding figure in 1949.

Member-bank reserve balances rose $258 million during the week ended July 26. Underlying changes thus reflected include increases of $161 million in Reserve bank credit and $5 million in Treasury cash and decreases of $18 million in non-member deposits and other Federal Reserve accounts and $114 million in money in circulation. Declines of $21 million in Treasury deposits with Reserve banks and $50 million in the monetary gold stock were also reported.

Total loans and investments of reporting banks advanced $289 million during the week ended July 19. An increase of $66 million in commercial, industrial, and agricultural loans was recorded. Total business loans, at $13,791 million, were $921 million more than the comparable sum a year ago.

Skyscrapers were built for the same reason!

High cost of ground area made it far cheaper for skyscrapers to go *up* instead of spreading out. Towmotor HIGH STACKING offers the same cost-saving opportunity to industry. Towmotors stack *ceiling-high*, save valuable warehouse space, free floor areas for needed production lines. Cut production costs, increase profits—write for "Handling Materials Illustrated." Towmotor Corporation, Div. 45, 1226 E. 152nd St., Cleveland 10, Ohio. Representatives in all Principal Cities in U.S. and Canada.

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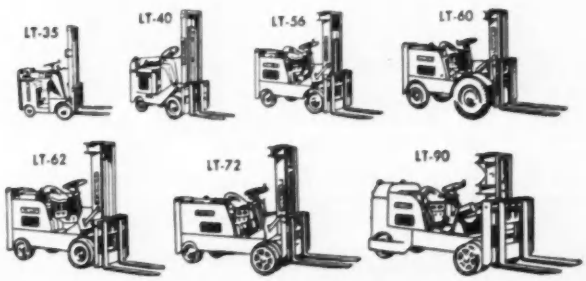

7 OF THE 12 STANDARD MODELS FOR HANDLING 1500 TO 15,000 LB. LOADS

NEW PRODUCTS

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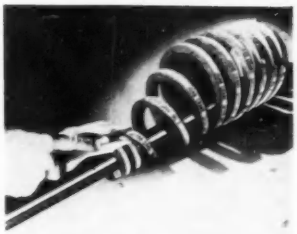
(Continued from page 64)

P-39—Tape-Backed Spiral Packings

Crane Packing Co. of Chicago, Ill., has added a securely vulcanized tape-back as an integral part of all their "Super Seal" spiral plastic packings. The tape-back prevents breakage when installing.

The development increases packing flexibility and brings a plastic packing into the easy-to-handle class of ordinary braided fabric styles. Ring cutting is greatly simplified with this type of reinforcement because the spiral can be twisted down to small shaft sizes, and then cut into rings without breakage. Elimination of the normal breakage which occurs in twisting-down means that none of the packing need be thrown out because of handling damage.



Crane Super Seal plastic packing with vulcanized tape backing

Packing style identification has also been solved with addition of this tape-back construction. Each Super Seal style is clearly marked in a different color for ready identification under the most adverse installation conditions.

The "John Crane" Super Seal line of packings is furnished in six different styles to cover the range of operating conditions met throughout industry. They are extremely resilient and homogeneous, and are composed of asbestos, anti-frictional metal particles, flake graphite, and special binders. They do not harden at elevated temperatures and need not be removed as wear occurs. The adding of an additional ring to the stuffing box is sufficient to maintain leak-proof service.

P-40—Resistance Boxes

New resistance boxes brought out by Leeds & Northrup Co., Phila., Pa., as moderate-precision, adjustable standards for d-c and for a-c resistance measurements up to medium frequencies, provide an entirely new type of rotary switch having exceptionally low and stable contact resistance, which is obtained through use of solid silver switch contacts and silver alloy multiple-leaf brushes. Zero or contact resistance is less than 0.002 ohm per decade and changes less than 0.0005 ohm per decade on accelerated life tests. Switches are totally enclosed to keep out dust, and are equipped with adjustable indexing action.

Terminals are knurled, all-metal, plated for low contact resistance. They accommodate banana plugs, spade or spring clips, or bare wire of any size —give positive electrical contact even on fine gage wire without danger of shearing. Boxes are thoroughly shielded

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- Underwriters' Approved
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30" x 24" CECOSTAMP showing special notch for keying dies in ram and anvil bolster plate. Equipped with special foot treadle

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NEW PRODUCTS

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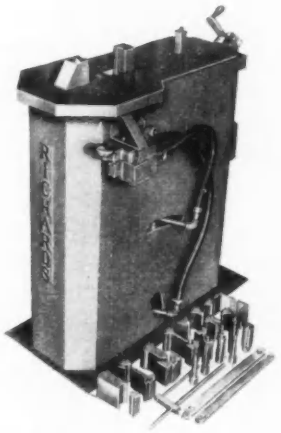
in grey enameled metal cases.

Limit of error is ± (0.05 per cent + 0.005 ohm). The 4-dial model has a range of 11,110 ohms in 1-ohm steps. The 5-dial models cover 11,111 ohms in 0.1-ohm steps or 111,110 ohms in 1-ohm steps. Time constant at 50 kc for usual range is less than 0.005 microsecond.

P-41—Air Model Bender

An air model "Multiform" bender with 4-way control valve, put out by J. A. Richards Co., Kalamazoo, Mich., is built in two sizes for handling material up to ¼ by 3 in. or ¼ by 4 in. and is sold complete with all dies and mandrels as illustrated. Blanks, havdovetails, can be furnished so that the operator can make special forming dies to fit requirements.

Control is "Fingertip" by means of Hannifin 4-way valve, on an air pressure of 105 lbs, through multiple toggle train. All working parts are of hardened steel, and all bearings have renewable hardened bushings, with grease gun fittings.



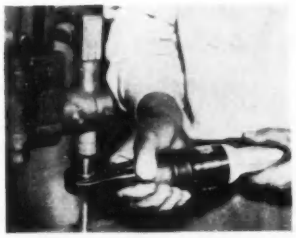
Richards air model "Multiform" bender

This air model is adapted for forming busbars for large switch boards, and for fabricating work.

P-42—Pneumatic Electrode Dresser

For redressing round electrodes of single- or multiple-point welding machines, Keller Tool Co., Grand Haven, Mich., has developed a new air-powered electrode dresser.

The new tool, which combines the functions of both angle- and thin-type dressers, is designed quickly to restore electrodes to original shape without



Keller pneumatic electrode dresser

IMPARTIAL TESTS PROVE NEW MUFFLER SUPERIOR!

Fully-engineered Donaldson Heavy-Duty Mufflers assure —
- lower noise level
- lower back pressure
- longer life
- better engine performance

To help truck manufacturers and fleet operators satisfy public demand for noise abatement and to help reduce operator fatigue, Donaldson engineers developed this completely new exhaust silencing system. Lower noise level is obtained without power penalty! The back pressure of these Donaldson Mufflers falls well within the "acceptable range" permitted by engine manufacturers. Heavy-duty engines can now deliver their full rated power without objectionable exhaust noise.

In tests before impartial juries of highway officials, truck owners and truck manufacturers, the new Donaldson Mufflers were rated superior on overall performance. These tests proved that lower noise level and lower back pressure *can be combined* in a *fully-engineered* muffler. Furthermore this muffler is available at reasonable prices for popular models of heavy-duty trucks.

DESIGNED FOR HIGH OUTPUT ENGINES

Donaldson engineered exhaust systems have these additional advantages: Reduced valve pounding, improved volumetric efficiency of the engine, decreased fuel consumption, less smoke and fumes, lower muffler jacket temperatures and less cab-panel drumming and vibration. You get them all when you equip your engines with Donaldson Mufflers. *Made of aluminized steel throughout* to resist corrosion, Donaldson Mufflers last longer—100,000 miles of service is not unusual!

For results of official motor truck association muffler tests and complete information on Donaldson Muffler Systems, write us giving engine specifications. We can make immediate shipment for gasoline or Diesel engines in the 150 to 300 H.P. range.

Model M90010 vertical cab-mount muffler. *Dimensions: 9" diameter, 52" body length, 4 1/32" I.D. sleeves.*

Model M01201 oval-type for under-chassis installations

10" x 15" oval, 25" body length, 4 1/32" I.D. sleeves.

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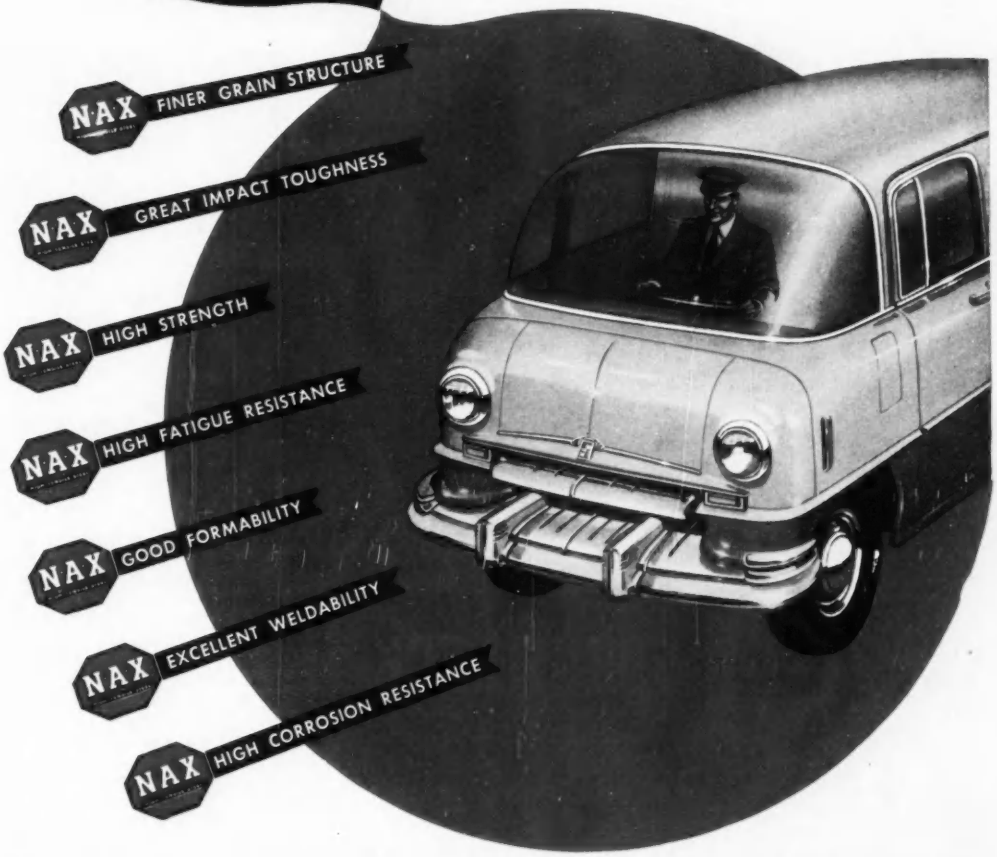
HIGH-TENSILE STEEL

SEVEN STRONG REASONS explain the trend to N-A-X HIGH-TENSILE steel in the manufacture of commercial vehicles.



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their removal from the welding machine.

The cutter attachment of ¾ in. thickness readily accommodates close-clearance jobs. Both Porter and Severance type cutters can be used, the changing of cutters being made easily. Fast cutting action is provided by a free speed of 1750 rpm.

The new dresser assures uniformly dressed electrode points, eliminates costly hand filing methods, and greatly reduces the usual shutdown time for servicing multiple-spindle machines.

Over-all length of the Keller dresser is 12¾ in.; net weight, 4½ lbs.

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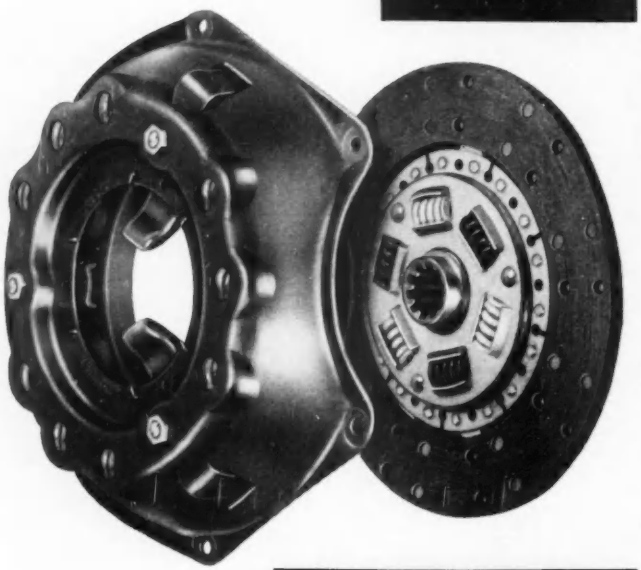
MINIMUM MAINTENANCE!



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CLUTCHES...FOR THAT VITAL SPOT WHERE POWER TAKES HOLD OF THE LOAD!

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Chicago 38, Illinois

P-43—Fork-Shovel Attachment

A heavy-duty fork-shovel attachment for lift trucks, with 7¾-in-long tines, is designed by Clark Equipment Co., Battle Creek, Mich., to easily handle loose materials such as castings, forgings, coal, coke and broken stone, by reason of heavy, tapered tines which ease their way into and under materials with minimum tractive effort, and with least possible shock to the truck.

The hydraulically-controlled shovel can be tilted up to 40 deg above horizontal, including 10 deg tilt of the upright assembly, which permits scoop up of maximum loads without ramming the stock pile. Generous backward tilt assures security of loads during transportation.

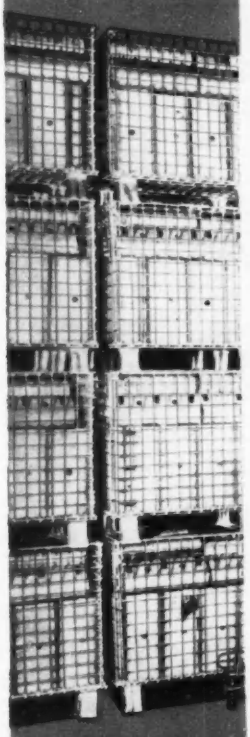
Hydraulic controls ease the dumping action and strain on the upright assembly. A steep dumping angle—48 deg, including 3 deg of forward tilt, simplifies load-discharge. Since the fork-shovel need not be lowered to the ground in order to return it to horizontal position, the attachment is fast and easy to operate.

Clark heavy-duty fork-shovel attachment for lift trucks

Actuated by an auxiliary valve, the fork-shovel manipulation has no effect on the lifting operation, nor on tilting of the uprights. The attachments is readily interchangeable with many others, and with standard forks available for use on Clark fork-lift trucks. It is ready for installation on gas-powered and electric battery-powered Clark Carloader and Utilitruc models, and on the gas-powered Yardlift-40 and Yardlift-60 models.

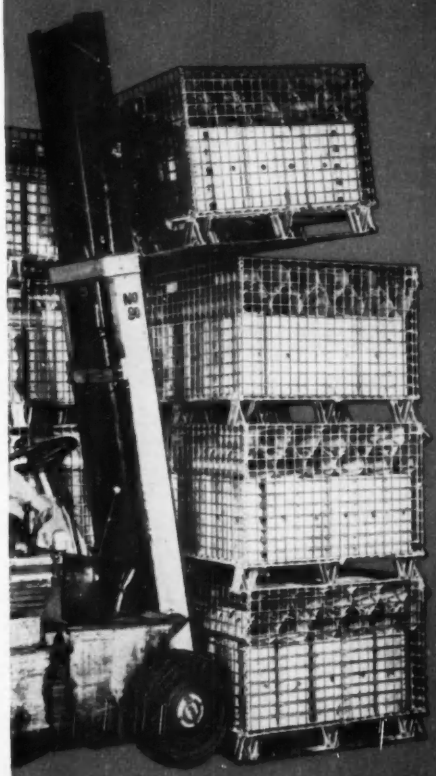
(*Turn to page 78, please*)

Pittsburgh CARGOTAINERS



YOU SAVE ON

Handling with Cargotainers, as parts from production line go directly to **storage** or shipping dock. Inventory is easy—items accessible at all times. **Shipping** costs are reduced. There is no re-handling of parts. Fork truck delivers from receiving dock to **assembly line.** Use Pittsburgh Welded Wire Cargotainers—they fold, save space, time and money. Write Department AI.



Pittsburgh Steel Products Company

A Subsidiary of

Pittsburgh Steel Company, Pittsburgh, Pa.

DANLY PRESSES

PAY OFF AT HOTPOINT—

. . . in plant 5 at Milwaukee where press work is the key to efficient, high speed production of electric water heaters and automatic dishwashers.

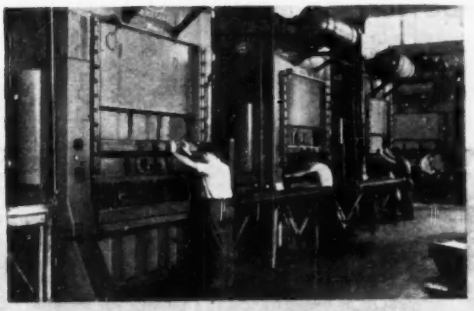
DANLY PRESSES SET THE PACE on the line that mass produces these 33 gallon water heater tanks. Extra heavy Danly frame construction assures the steady, day after day press performance that makes a picture like this possible. At Hotpoint, press operations are a vital factor in nearly all production.

Special Danly Press construction and engineering features assure the uninterrupted performance so important wherever production schedules run close to actual machine capacity. Just one of these features, the new Danly cool-running clutch, reduces clutch wear—a major cause of press down time. In over two years of operation, the Danly Presses at Hotpoint have required no major clutch maintenance . . . no relining and only 1 take-up!

Other outstanding Danly Press features include complete pressure lubrication and a specially designed control system. Write today for the new Danly Straight Side Press Catalog—check the specific advantages of Danly Presses in your plant.

JUST AS IT COMES FROM THE MILL, steel goes into production. The skidded stacks are simply unstrapped and fed directly to the Danly Press for blanking. The incoming steel storage area immediately adjacent to the beginning of the production line cuts down on costly material handling and simplifies stock control.

AT THE HEAD OF THE TANK LINE, the first operation is performed in this 500-ton Danly Press . . . a good way to start production! Tank Ends are blanked from 3/16" hot rolled steel in a 1 stage die at a rate as high as 220 pieces per hour. The circular blanks produced are approximately 22" in diameter.



. . . AND MAINTAIN THE PACE! This bank of four 250 ton Danlys, in addition to performing general purpose stamping operations, works almost continually to "take up the slack" in the entire stamping production schedule. Whenever production lags on one part or another, these Danly's keep the assembly line rolling. The fourth press in series is set at right angles to the others to increase flexibility of conveyor layouts.

SUPERVISING QUALITY assures high working standards and precision. Here, details of a reinforced water heater bottom stamped in three operations on a series of Danly Presses are checked. An interesting highlight is the quality control sample board in the background. The stamped parts are properly coded to provide a quick running check on die performance. New samples taken at frequent intervals give a true picture of current production quality.

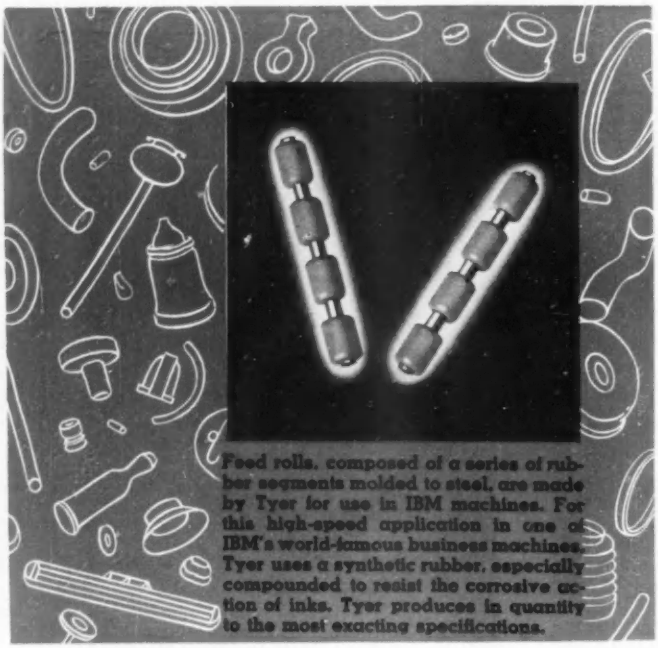
DANLY®

It Costs Less to Run a Danly Press!

DANLY MACHINE SPECIALTIES, INC.

2100 SOUTH LARAMIE AVENUE, CHICAGO 50, ILLINOIS

MECHANICAL PRESSES . . . 50 TO 3,000 TONS

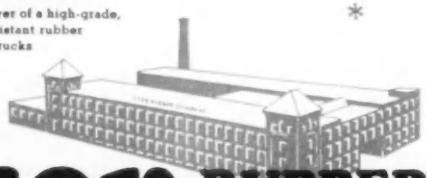


Feed rolls, composed of a series of rubber segments molded to steel, are made by Tyer for use in IBM machines. For this high-speed application in one of IBM's world-famous business machines, Tyer uses a synthetic rubber, especially compounded to resist the corrosive action of inks. Tyer produces in quantity to the most exacting specifications.

For 94 years Tyer has been doing remarkable things with rubber. Tyer originated WHITE RUBBER and ELASTIC WEBBING. Tyer's war products ranged from giant pontons to tiny earplugs made to a tolerance of one thousandth of an inch. Today Tyer leads in SERVICE to INDUSTRY. Many of the country's finest products have vital rubber parts made by Tyer. These famous manufacturers know that Tyer does unusual things with rubber.

A shock insulator made by Tyer of a high-grade, resilient, oil and weather resistant rubber compound to protect heavy trucks from road shocks.

If there is a rubber part in your product (old, new or proposed) Tyer technicians will give you the utmost cooperation in putting all Tyer's 92 years of experience at your service. Ask the Tyer representative. Write to us in Andover or to the nearest branch.



Tyer RUBBER COMPANY

ANDOVER, MASSACHUSETTS

189 Duane St., NEW YORK 189 W. Madison St., CHICAGO 3-252 Gen. Motors Bldg., DETROIT

NEW PRODUCTION AND PLANT EQUIPMENT

For additional information regarding any of these items, please use coupon on page 58

(*Continued from page* 54)

of the table-top may be removed, uncovering a brass (or stainless steel) quench tank 24 in. by 24 in. by 18 in. deep, fed by a 1 in. water line, solenoid controlled. This sink can be used for water, oil or brine quenching. It will also accommodate the Lepel Roto heating and quenching unit, designed for the hardening of gears, blanks, etc. Heating and quenching cycles are controlled by a three circuit timer operated by push-button or footswitch.

M-28—Steam Spray Painting Boiler

Anticipating a sudden swing to steam-spray finishing in spray painting technique, Livingstone Engineering Co. of Worcester, Mass., announces the Speedylectric SP500 all-electric steam power plant with built-in 100 psi boiler.

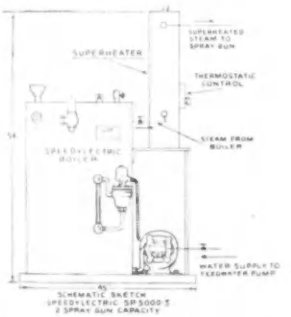


Diagram of Livingstone Engineering steam-spray painting boiler, the Speedylectric SP500

The SP500 includes an electric superheater with thermostatic control and boiler feed pump, motor and controls. The boiler is self-regulating, maintaining electric input in exact balance with steam output. Now available, in a range of capacities from 1 to 10 spray-guns or larger, the unit operates on 220, 440, 550 volts AC current, single or polyphase. This Speedylectric SP500 boiler is described as being without flame or fire hazards, free from all low water danger, and with no coils or tubes to burn out, to scale or to replace.

In the field of spray painting using steam instead of compressed air, the company points out, tests indicate that one pass application produces 2 mils of film with less overspray, thereby saving labor, paint, and thinner.

Inclusion-free high-carbon ferro chromium

assured by new process

MOST ball and roller bearings must take terrific punishment in service, and their dependability is based directly upon the quality of steel from which they are made.

To meet the requirements of the bearing manufacturer and his customers, the steelmaker can rely upon our newly improved ferro chromium to help him produce consistently high grade bearing steels.

The high-carbon ferro chromium we have recently developed is exceptionally free from non-metallic inclusions, entrapped slag and dissolved gases. It is made by a new process* which includes filtering out harmful inclusions by pouring the metal, as tapped from the furnace, through a layer of molten slag of special composition. In addition to removing the undesirable inclusions, this process also assures greater density of the metal and the absence of shrinkage cavities in individual lumps.

High-carbon ferro chromium contains 66 to 70 per cent chromium, 4 to 6 per cent carbon, and 3 per cent maximum silicon.

Our technical staff will be glad to demonstrate to you the benefits to be gained in your steelmaking by the use of this improved high-carbon ferro chromium. *Patented

MAKERS OF ALLOYS CHEMICALS AND METALS

VANADIUM CORPORATION OF AMERICA

420 LEXINGTON AVE., NEW YORK 17, N. Y.
CHICAGO • DETROIT • CLEVELAND • PITTSBURGH

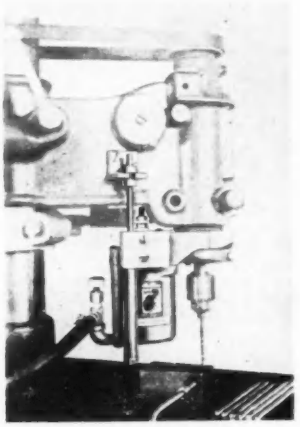
NEW PRODUCTS

For additional information regarding any of these items, please use coupon on page 58

(*Continued from page 72*)

P-44—Hydraulic Drill Check

In the power feeding of a drill the Hydro-Check announced by Mead Specialties Co., Chicago, Ill., is said to meet most situations requiring steady resistance to the power of the air feed, or increased resistance at a definite point in the stroke. It is easily attached to the Pneumatic Drill Press Feed through two holes in the mounting blocks, and connected to the head of the drill press by means of a small bracket as illustrated. Two collars on the ram can be set at any desired point.



Mead Hydro-Check attached to drill press

The Hydro-Check can also be used with single acting air cylinders to provide a cushion effect for certain jobs.

DEPEND ON *Mitchell* FOR THESE

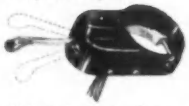
SPECIALIZED PRODUCTS

- **Ignition switches**
- **Turn signal switches**
- **Rolled shapes**

AUTOMOTIVE IGNITION SWITCHES

Installed as original equipment on many popular-make motor cars, trucks and buses, Mitchell ignition switches are known for their sturdy construction and extra long life. "Radio" position available without extra cost.

Mitchell ignition switches, turn signal switches and rolled shapes meet the most exacting specifications of the automotive industry for quality and excellence of design. You will find these Mitchell products widely used by leading manufacturers of cars, trucks, buses and tractors.



Mitchell clamp-on and screw type semi-automatic turn signal switch for trucks, cars, buses, tractors.

Mitchell 6-wire concentric type semi-automatic turn signal switch used in passenger cars.

TURN SIGNAL SWITCHES — Mitchell semi-automatic, self-cancelling turn signal switch affords motorists an easy, positive method of indicating right or left turns — gives pedestrians and approaching and following vehicles accurate, fully visible turning information.

ROLLED SHAPES—Mitchell offers a complete range of metals, designs and gauges in stainless steel, aluminum, brass, bronze, copper; cold rolled, drawn and pressed for automobiles, airplanes, architectural requirements, railroad cars, radios, television receivers, all industrial uses.

Our sales engineers work with you in the application of Mitchell products to your specific designs. Call on us at any time.

UNITED SPECIALTIES COMPANY

MITCHELL DIVISION • PHILADELPHIA 36

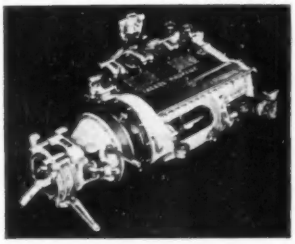
IGNITION AND TURN SIGNAL SWITCHES • ROLLED SHAPES • DOVETAILS

UNITED AIR CLEANER DIVISION • CHICAGO 28

AIR CLEANERS • METAL STAMPINGS

P-45—Engine for Propane Fuel

A line of commercial engines consisting of four different models of from 162 to 250 bhp to operate on propane fuel was announced recently by Fageol Products Co. of Kent, Ohio. Engines are built around one basic design with all major parts interchangeable. A feature of Fageol propane engines is their operation at a 10 to 1 compression ratio (15 to 1 ratio is available if desired). According to the manufacturer, this permits full utilization of propane's 125 octane rating.



Fageol engine for operation on propane fuel

The 10 to 1 compression ratio is made possible by employment of a unique combustion chamber claimed to permit use of a higher compression for greater power output without increasing bear-

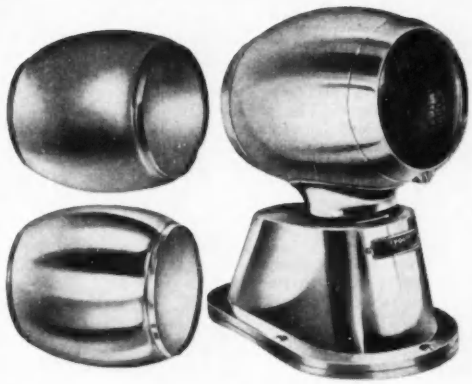
A LESSON IN SAVING—

Production Problem + REV-O-LITE ENGINEERS + REVERE = ELIMINATION OF COSTLY FORMING OPERATIONS, BRAZING AND EXTRA HAND FINISHING, PLUS FASTER PRODUCTION... AND AN IMPROVED PRODUCT

IN the development of their Rev-O-Lite, a revolving warning light for emergency vehicles, the Balford Corporation, Jacksonville, Florida, found themselves faced with a production problem regarding the cylindrical shell which contains the lights. The question was; what would be the most efficient and economical way to produce this shell that measures 6″ in length and is 4½″ in diameter at the ends? Should it be formed from a metal strip and brazed? Could tube be used and bulged in a die? Or, should some other method be employed?

Revere, working with the design engineers of the Balford Corporation, exchanged ideas, weighed the pros and cons of various methods; experimented. They found that by using 70/30 Revere Brass Tube in a light anneal temper, it would take the bulging in the die satisfactorily and at the same time show up well as far as grain size control was concerned. By this method, complicated and costly forming operations and brazing could be eliminated, production speeded and the shell formed without any unsightly seam. Also, no extra hand finishing would be necessary before plating.

Perhaps one of the many types of Revere Brass or one of the other Revere Metals or Alloys can help you improve *your* product —cut your production costs. Why not tell Revere's Technical Advisory Service about *your* metal problems? Call the Revere Sales Office nearest you today.



UPPER LEFT shows brass shell of the Rev-O-Lite as it comes from the bulging die. Without any extra finishing, which would have been necessary had shell been made of strip and brazed, shell is chrome plated as shown at lower left. At right is the completed assembly of the Rev-O-Lite ready for action on the roofs of all kinds of emergency vehicles such as police patrol cars, ambulances, fire trucks, etc. Chrome finish base is of cast zinc alloy.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, New York

• • •

Mills: Baltimore, Md.; Chicago, Ill.; Detroit, Mich.; New Bedford, Mass.; Los Angeles and Riverside, Calif.; Rome, N. Y. — Sales Offices in Principal Cities, Distributors Everywhere.

NEW PRODUCTS

For additional information regarding any of these items, please use coupon on page 58

ing loads. Controlled turbulence within this combustion chamber provides efficient scouring action that prevents accumulation of carbon deposits.

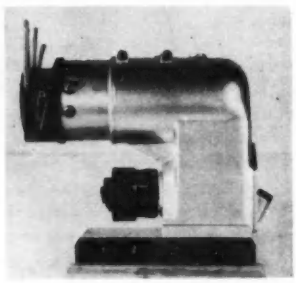
Engines are available for horizontal or vertical mounting, right or left hand installation, clockwise or counterclockwise rotation.

P-46—Racing Magneto

The type "L" Vertex racing magneto, a product of the F. T. Griswold Mfg. Co. of Wayne, Pa., makes it possible for the first time to equip high speed engines, such as used for racing, with the Vertex one half engine speed magneto. Heretofore, it is pointed out, all the special built American racing engines have been forced to rely upon the crankshaft speed magneto having internal gears and operating at dangerously high rotational speeds.

With the "L" type Vertex, the magneto rotating speed is reduced by one-half, accomplished with a magneto unit having no internal gears. The "L" type Vertex will mount on the same base pad and can be driven by the same crankshaft speed magneto driving shaft already standardized on the engines in question.

To provide the necessary variation in speed between the engine magneto driving shaft and the one-half crankshaft speed Vertex, an ingenious reduction drive unit acts not only as a speed reducer but also as a base mounting housing to hold the magneto in the most favorable position.



Griswold Vertex racing magneto, type "L"

The "L" type Vertex racing magneto is equipped in the standard form with a built in retard-advance mechanism so as to enable racing engines to be easily started and idled on a properly retarded spark which automatically advances to optimum spark setting for full power operation as engine speed is increased.

Other features of this modern magneto ignition system are an infinitely adjustable Vernier driving coupling; shock proof universal coupling connection piece; the magneto unit quickly removable without disturbing drive housing; and platinum breaker points easily reached for adjustment. Fully automatic retard-advance mechanism can be calibrated to follow any advance curve desired. Lubrication is completely self-contained and attention free. Condenser is separately mounted in breaker point housing for easy inspection. Breathers provide high speed ventilation. Fastening holes match standard magneto mounts.

The magneto is available for four, six and eight cylinder engines.

(*Turn to page 82, please*)

To make
HARDENED & GROUND PARTS
Requires EXPERIENCE!

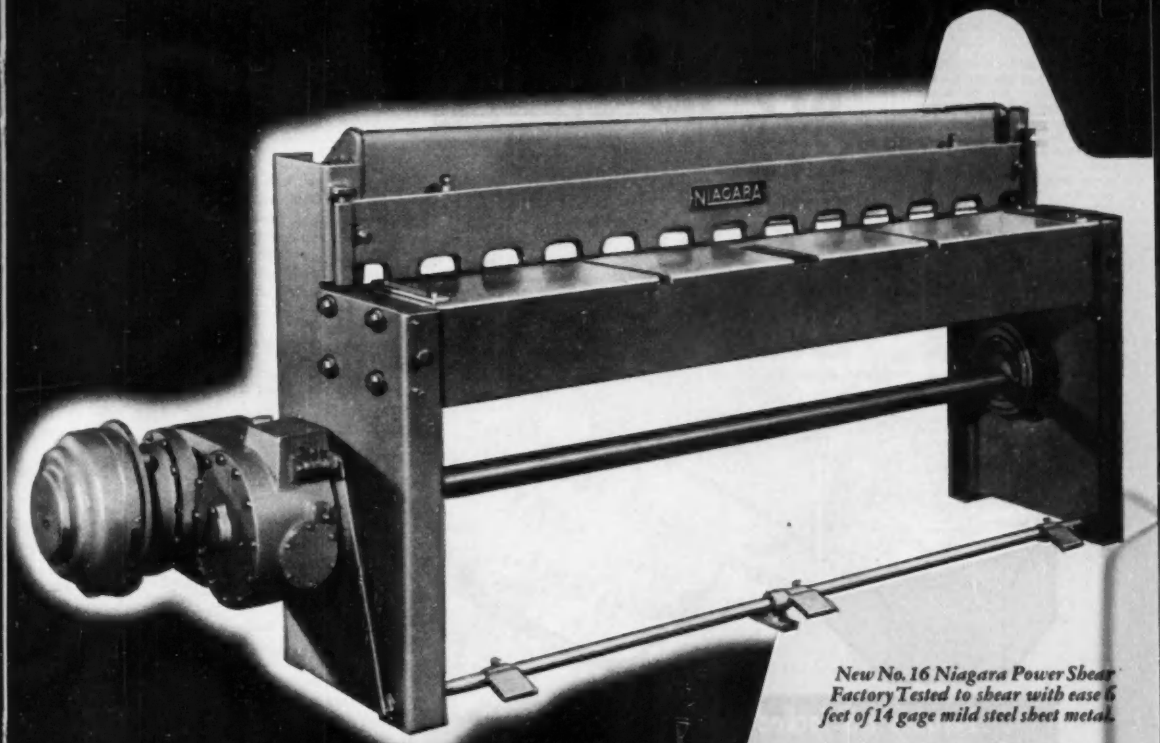
NOTHING we make tells a more complete story of quality than the king pin shown here—involving expert knowledge of materials; close-limit, intricate machining; scientifically controlled heat treatment; and micro-finish grinding. Result: A product in which both automotive manufacturers and ultimate users can have the utmost confidence.

Our specialization of over 40 years has earned us many satisfied customers among makers of trucks, tractors, trailers, buses, axles, off-the-road machines, and Diesel locomotives. We would like to have you consider Brown Hardened and Ground Parts for your own requirements. Please write or wire.

Henry W. Brown
PRESIDENT

Parts include . . .
King Pins
Shackle Bolts
Shackle Pins
Brake Anchor Bolts
Countershafts
Idler Shafts
Stub Axle Shafts
Steering Ball Bolts
Beam Balls and Bolts
5th-Wheel Rocker Shafts
Wheel Studs
Water Pump Shafts
. . . anything in the hardened and ground line, of any analysis steel, up to 4¼" diameter.

THE BROWN CORP.
213 BELLEVUE AVE. SYRACUSE, N. Y.
C. H. Ehlert, 3407 Clarendon Rd., Cleveland • N. F. Spring, 4716 Balfour Rd., Detroit • R. G. Sanderson, 5252 Broadway, Chicago • Harry J. Windmiller, 1704 Carlton, Fort Worth • Elmer L. Kingsland, 6888 Beechley Ave., Long Beach, Calif. • J. B. Hunt, E. L. Kingsland Co., 5811 S. E. Yamhill St., Portland, Ore.



New No. 16 Niagara Power Shear Factory Tested to shear with ease 6 feet of 14 gage mild steel sheet metal.

NIAGARA ANNOUNCES

New Power Squaring Shears Especially Designed for the Thrifty Sheet Metal Shop

- Greater production at 85 cuts per minute
- Constructed of unbreakable steel throughout
- Closed box section bed and cross-head for maximum rigidity
- A new leader in styling
- New hi-power totally enclosed drive
- Famous patented Niagara Sleeve Clutch
- All gears and clutch operate in bath of oil
- Four cutting edge knives
- Entire drive and main shaft operate on anti-friction bearings
- Cam actuated detent eliminates brake. Never needs adjustment
- Selective control for continuous or single stroke operation
- Parallel Back Gage, self measuring, ball bearing

Write for Bulletin 71-J

NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, NEW YORK

Manufacturers of Presses, Shears, Machines and Tools for Plate and Sheet Metal Work

DISTRICT OFFICES: DETROIT • CLEVELAND • NEW YORK

NEW PRODUCTS

For additional information regarding any of these items, please use coupon on page 58

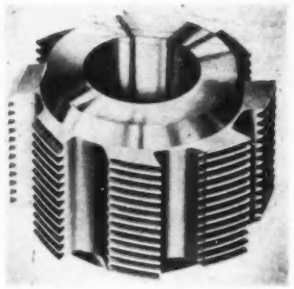
(*Continued from page 80*)

P-47—Fine Pitch Hobs

Available from Illinois Tool Works, Chicago, Ill., is a complete assortment of fine pitch hobs for high production precision tooling of small gears used in clocks, instruments, timers and small mechanisms of all types.

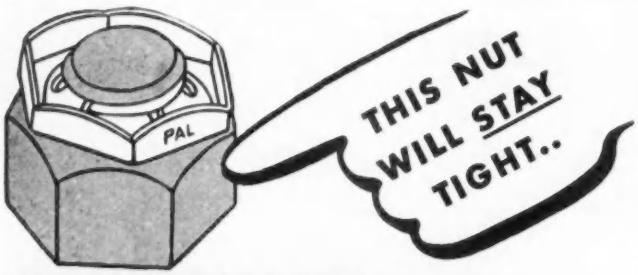
Fine pitch hobs are those used to cut 20 D.P. gears and finer. Extreme precision requirements in this field of tool manufacture and application are illustrated by the standard tolerance for fine pitch hob lead variation in one turn—0.0003 in. maximum. In the gears produced, a profile error of only 0.0002 in. can represent as much as 3 per cent of total tooth thickness.

The small size of fine pitch hobs together with these extreme precision



Illinois fine pitch hob

requirements give rise to unusual inspection problems. Special equipment necessary to perform lead checks is not generally available. As a special service, Illinois Tool Works solves this problem for fine pitch hob users by furnishing a Toolgraph Chart with every Illinois fine pitch hob shipped. This Toolgraph Chart is an easily-read, individual graph of the actual variation in the lead of each hob. The need for difficult fine pitch hob lead inspection in the hob user's plant is thereby eliminated.



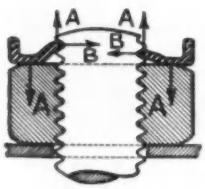
...because it's locked with a

PALNUT
Trademark
LOCK NUT

WITH an ordinary nut carrying the load, and a PALNUT to keep it tight—you have a powerful fastening team that licks vibration, stress, heat and oil. PALNUTS provide absolute security wherever bolt-and-nut assemblies must stay tight—on structural members or engine parts. Low in cost, light in weight, require small space, apply speedily with hand or power drivers.

AUTOMOTIVE USES: Connecting rods, main bearings, engine mountings, brake parts, body hold down, shock absorber mounting, etc.

WRITE FOR LITERATURE GIVING FULL DETAILS



DOUBLE LOCKING ACTION

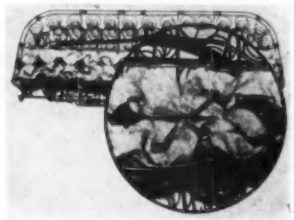
Powerful spring tension (A-A) is exerted upward on the bolt threads and downward on the ordinary nut, while slotted jaws (B-B) close in and grip the bolt like a chuck.

THE PALNUT COMPANY

60 Cordier St., Irvington 11, N. J.

Detroit Office: 8100 Lyndon Ave.

P-48—Cord for Tieing Seat Cushion Springs



Stalwart extruded rubber cord for tieing seat cushion springs

Availability of a new extruded rubber cord developed especially for use in the automotive industry to "tie" seat cushion springs, is announced by the Stalwart Rubber Co., Bedford, Ohio. Required characteristics of the cord are said to make it suitable for many applications in the aviation, refrigeration,

(*Turn to page 85, please*)

FOURTH IN A SERIES of antique car paintings is this charming Model T Ford Roadster of 1910. Everything shown in the illustration was included in its price of $900, and a four-cylinder, 20 h.p. motor is said to have averaged 20 miles to the gallon. Gracefully she turned in a 28-foot circle; was advertised with appropriately quaint phraseology such as . . . "Here is a man-sized car, not a miniature, which has proven itself altogether satisfactory from the standpoint of 'get-there' possibilities."

Excellent color reproduction of this automobile for framing will be sent to you on request. Please use your company letterhead. Supply limited.

The little black bird that longed for bright colors

NOT so very long ago there lived a little bird who wore a little black coat; and when he noticed the other birds smartly attired in bright colors, began to long for some color variety in his own wardrobe.

All of which helps to illustrate the story of a little car which not so very long ago was finished only in black. There were some very practical reasons why black was a fixed standard on the early models of these famous cars, but all of the practical reasons of yesterday have been set aside in the face of a single compelling fact . . . American car buyers demand and love color variety.

The love of color is natural indeed, for color is in truth a stimulating emotional phenomenon that moves men on to action. It is a motivating force of great power; has played a leading role in the sales drama of American automobiles and other great products of industry.

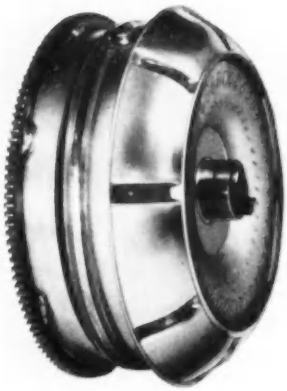
R-M

REG. U.S. PAT. OFF

RINSHED-MASON COMPANY 5935 MILFORD AVENUE DETROIT 10, MICHIGAN

"Proudly the automotive world displays the lustrous beauty of R-M Lacquers"

America's leading manufacturer of fine lacquers, enamels and undercoats for automobiles, trucks, farm equipment, appliances, and numerous other products of industry. We invite your inquiry.

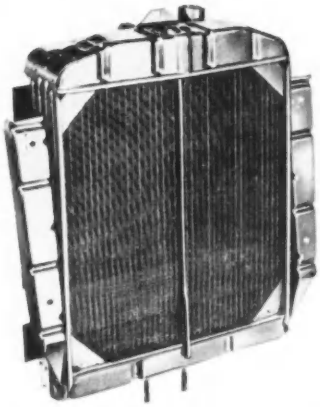


LONG TORQUE CONVERTER

Here's velvet-smooth power transfer, with torque multiplication of better than 2 to 1 at stall. Air-cooled for trouble-free service. Assembly units fabricated almost entirely from stampings for low-cost production.

LONG RADIATORS

Long radiators and maximum heat exchange have been synonymous throughout the automotive world since 1903. Fin-and-tube design and construction provide clean, unobstructed water courses. Capacities range from passenger car models to heaviest-duty commercial vehicle types.



LONG CLUTCHES

Effortless operation, dependable performance in stop-and-go traffic driving. At highway speeds, semi-centrifugal design gives increased torque capacity . . . less slippage, less wear. Long clutches have equipped millions of cars, trucks, buses and tractors since 1922.

ENGINEERING BW PRODUCTION

LONG MANUFACTURING DIVISION
BORG-WARNER CORPORATION
DETROIT 12 and WINDSOR, ONTARIO

LONG

TORQUE CONVERTERS • CLUTCHES • RADIATORS • OIL COOLERS

NEW PRODUCTS

For additional information regarding any of these items, please use coupon on page 58

(*Continued from page* 82)

electrical and other original equpment fields of manufacture.

Requirements were excellent tear resistance be ause of possible fracturing during fabrication; good resistance to flexing of cushion under passengers; and excellent age resistance because of extreme replacement diffi ulty should cushion failure precede life expectancy of the automobile. Other requirements were resistance to chemicals because the cord is installed prior to special paint dipping; heat resistance to withstand oven paint drying process; low permanent set to maintain original length during functional service life of the seat cushion; abrasion resistance to withstand contact with metal parts; and a low temperature resistance to meet operating conditions of world-wide use of the American-made automobile.

P-49—Thermocouples

Thermocouples having speed responses up to nine times that of previous models, developed by Minneapolis-Honeywell Regulator Co., Phila., Pa., are additionally improved by new butt-welding techniques.

Increased speed of response has been made possible by three major improvements. (1) The mass of the hot junction is considerably reduced in the 8-, 14- and 20-gage types; (2) The thermocouple wire is shaped to form a loop close to the hot junction. The insulator is faced about one inch from the welded tip, reducing conduction from the cold end; and (3) The dimensions of the loop permit it to fit tightly inside a well, furnishing metal-to-metal contact, and eliminating dead air space.

P-50—Valve Seat Insert

An improved valve seat insert brought out by Martin Wells of Los Angeles, Calif., to meet all size specifications for internal combustion engines, employs an alloy in the valve seat which has been so formulated as to be free from checking and burning under extreme temperatures. Nor will it fatigue and loosen in the block and under no conditions will this material air harden or work harden the company emphasizes. Due to the density of this material, the seats have the faculty of dissipating the heat trapped in the valve, materially reducing valve temperatures, thereby insuring longer valve life and less down time on heavy-duty engines.

MATCH YOUR GRINDING NEEDS

with Abrasive Wheels Custom-Made for You—at No More Cost...and Prompt Delivery

You Profit 4 Ways

- Better Finish
- Longer Wheel Life
- Easier Cutting
- Lower Grinding Cost

Output Doubled... First Cost Cut
Besly-Titan Resinoid Wheels used on High-Speed Swing-Frame Grinders at a large Midwestern Foundry — grinding Grey Iron and Steel Castings — doubled previous daily production, gave faster, cooler cut and *with the use of the lower priced Aluminum Oxide Wheel on both steel and iron castings*, resulted in additional saving in initial cost.

Better Work... Low Wheel Cost
At one of the country's largest tool steel mills Besly-Titan Resinoid Abrasive Wheels on Swing-Frame Grinders process Steel Billets. Removing deep cracks and pits with fewer heat checks and blemishes, they have proven superior to four competitive makes — and at a surprisingly low abrasive wheel cost of approximately $10 per day.

Wheel Life Increased One-Third
Grinding knife blades on Blanchard Machines using 30" wheels, one of the largest shops in the country — after considerable testing of many sources — had for years been using wheels of a competitive make which ran 60 hours. Besly-Titan Wheels, scientifically developed for the particular operation, are now on the job and *lasting 80 hours.*

Shop reports show that grinding wheels and discs save time and labor when they are made-for-the-specified-job . . . and they give better results.

Besly-Titan makes up abrasive wheels and discs to match *individual job specifications* . . . and you get the right abrasive — in the exact proportions — properly bonded — that will do *your* job best. What's most important—you *pay no more* than for ordinary stock wheels or discs. Deliveries are a matter of only a very few days.

See for yourself how this works out by talking over your grinding needs with a Besly-Titan field engineer. Let us show you how you can save *—and still get better work*—with Besly-Titan Wheels and Discs made especially for you. Write us for full information.

BESLY

TAPS—the world's most accurate tap. TWIST DRILLS AND REAMERS—Complete line for every need. BESLY-TITAN ABRASIVE WHEELS AND DISCS—individually formulated for your job. GRINDERS that reduce costs on every type of surface grinding.

CHARLES H. BESLY & COMPANY

118 N. CLINTON STREET, CHICAGO 6, ILLINOIS

Factory: Beloit, Wisconsin

Huge Dynamometer

(*Continued from page 47*)

The tailstock is power traversed and includes the large, double-ended torque arm. The torque output system consists of the arm, a movable strut, secondary levers, and a precise weighing device. The strut can be positioned to provide the following torque ranges in either direction of rotation: 1,200,000; 600,000; 400,000; 240,000; 150,000 and 100,000 lb-in. at full scale reading of the instruments. The instrument panel is arranged to provide functional grouping of instrument and controls with both indicating and strip chart recording of all necessary effects. Each instrument, gage or controller can be individually cut in or out of operation, at will.

The lower photograph on page 47, illustrates the complete group of devices associated with the brake input and output controls, including the Uni-Tork valve, power cluster, solenoid valves, pressure regulators, etc. Note the T-slots on the bearing pedestal and tailstock, which provide a means of attaching accessories, gages and auxiliary equipment. The main drive consists of a General Electric motor-generator set (in an adjoining building), amplidynes, electronic regulators and the forced cooled, d-c motor. All wiring, piping and ducting is located under the floor which improves the overall appearance and provides an unobstructed area for the bridge crane which is used to shift the flywheel weights and mount and dismount brake components.

Practically all the present-day on-the-highway, off-the-highway, and railroad equipment can be handled, plus a generous margin to take care of the forseeable future. This is evident when the major specifications are analyzed which are as follows: The maximum flywheel load is 2800 slug ft^2. This can be reduced to as low as 205 slug ft^2 in uniform increments, with a total of 15 flywheel disks, giving a spread of over 13 to 1. Representative rubber-tired vehicle loads would run from a conventional three axle tractor unit, grossing 116,000 lb (based on a wheel loading of 24,000 lb on 13:00 x 24 in. tires) to a minimum of a truck in the one ton bracket. Brake-developed torques up to 1,200,000 lb-in. could be handled by the weighing system and the instruments. This is in excess of the best adhesion conditions of rubber tires on pavement. Maximum energy available to be dissipated by the brake equals 34,500,000 ft-lb at 1500 rpm.

The instrumentation is unusually complete and versatile. Both indicating and recording strip chart types are installed to measure the speeds, brake input effort in both air and hydraulic systems, brake output, stopping rates and temperatures. Test cycles can be set up to run on a time, temperature or manual basis. When using the Uni-Tork valve (developed by Raybestos-Manhattan) very informative data are obtained from friction material, as the brake is required to do a given amount of work on every stop. Without utilizing the Uni-Tork valve, it is impossible to compare the frictional characteristics and durability of frictional materials. The Uni-Tork valve does mechanically what the driver attempts to do by varying his pressure on the brake pedal to maintain a constant stopping rate.

All types of test cycles can be followed, including fades, recoveries, wear and pressure decelerations, with full recording of each factor. All instrument ranges have been selected to provide full coverage of the effects being measured, plus extra capacity to take care of the forseeable future. Instruments, test cycles, brake applications, etc., are under the guidance of the master controller (designed and built by Raybestos-Manhattan) which provides instant and complete control of the dynamometer. The instrument

Dole DV

Thermostats by truly modern performance from new design, will help sell your cars—make buyers boosters

Accurate, powerful thermal element.

Operates positively against high pump pressure of sealed cooling systems. Efficient with atmospheric systems.

Full seating pressure aids quick warm-up.

CONTROL WITH DOLE

THE DOLE VALVE COMPANY
1901-1941 Carroll Avenue Chicago 12, Illinois
Philadelphia • Detroit • Los Angeles

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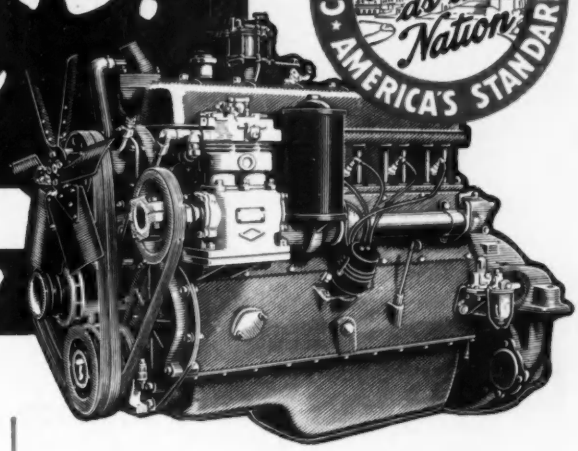
..the GREAT *NEW* CONTINENTAL

RED SEAL MODEL T-6427

CONTINENTAL MOTORS · AMERICA'S STANDARD · *Powerful as the Nation*



GREATER POWER

PLUS

ECONOMY AND LONG LIFE

•

New high-compression combustion chamber wrings the last ounce from the fuel —increases economy and smoothness by promoting turbulence.

•

New cam contours improve valve action, prolonging life of valves and springs.

•

New improved sodium-cooled exhaust valves with ***positive rotary action*** prevent power loss and spring damage due to carbon deposits on seats.

•

These refinements are IN ADDITION to such time-proven Red Seal features as patented individual porting, directional coolant flow, dynamically-balanced alloy steel crankshaft with Tocco-hardened journals, Durex-100 rod and main bearings, removable tappets, leakproof water pump, and other examples of progressive engineering which have made Continental engines first choice for countless specialized jobs.

Engineered to Today's Need for Rugged, Dependable Power

Balanced in all the factors that make for outstanding performance is this 1950 version of the T-6427, an engine that has proved, in millions of miles of service, an unusual capacity to "take it" where the going is tough. Drawing on experience dating from 1902, Continental engineers have joined improved materials, new features, and advanced manufacturing methods, under a unique system of product quality control, to achieve a new and brilliant combination of the qualities that count. New power and flexibility for larger payloads and faster highway schedules . . . new economy . . . new smoothness . . . new stamina for long trouble-free life—in short, the balanced performance that means lowest ton-mile costs. Write for bulletins and full information.

GENUINE CONTINENTAL PARTS AND FACTORY-AUTHORIZED SERVICE FROM COAST TO COAST

Continental Motors Corporation

MUSKEGON, MICHIGAN

panel, as well as all electrical circuits and piping, also was designed by Raybestos-Manhattan.

The instrumentation is designed to cover all of the above test requirements in both indicating and graphic forms. The following tabulation illustrates the scale ranges available on the initial installation:

Brake input (Air)—0 to 200 psi.

Brake input (hydraulic)—0 to 2000 psi.

Torque output—0 to 1,200,000 lb-in. in six ranges.

Temperatures—From ambient to 1200 F.

Stopping time—From 1/100 sec to infinity.

Speeds—0 to 1500 rpm in either direction.

A suction type brake assembly cooling system is included which can handle up to 6000 cfm of air at velocities of 3000 fpm.

· Variety in Gear Production

(*Continued from page* 50)

wide range of sizes running from 9 to 22 in. PD. All gears are made to customers' drawings, the customer also specifying the type of material and approved hardness pattern.

The method of producing flywheel rings by Automotive Gear is quite simple and can be summarized as follows:

1—Selected bar stock is first rolled into coil form.

2—Coils are cut apart by expanding and sawing.

3—Each ring is then butt welded in a heavy duty resistance welding machine. In the initial phase of this operation the hydraulic ram of the welder flattens both ends of the rings.

4—Rings then are normalized in a cylindrical furnace of Automotive's own design;

5—While still hot, upon emerging from the furnace, the rings are rounded to size in a die in an Elmes hydraulic press.

6—Sides and OD of rings are turned in Fay automatic lathes.

7—Bore is turned on Excello machines of special design. This is easily the controlling operation since the finished ring must be capable of a shrink fit on the customer's flywheel.

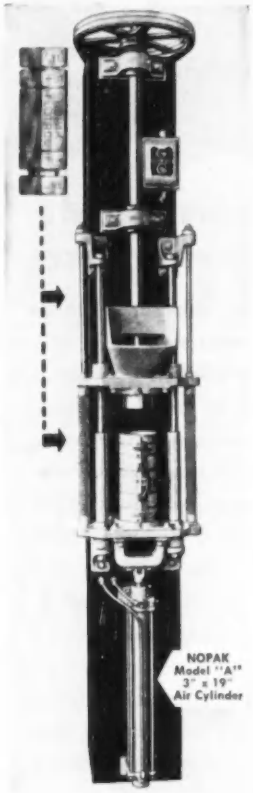
8—Hobbing of gear teeth on Gould & Eberhard single spindle hobbers. It is of interest that from 11 to 27 rings are hobbed in one setting depending upon size.

9—Final major operation is tooth hardening in Cincinnati Flamatics.

At the present writing the company has three of the Flamatic units, a new unit having been installed recently. The latter is capable of handling the largest ring gears made here and is fitted with six gas burners as may be seen in the illustration. The other two machines handle smaller diameter gears and have four burners. Hardness ranges from Rc 50 to 60.

Except for hand loading the operation of Flamatics is completely automatic. High temperature flame heats the gears and surface temperature is finely controlled by an electronic system which holds it within plus or minus 5 F. As the heating cycle is completed, the gear is automatically unloaded and dropped onto a conveyor which carries it through an oil quench tank built into the machine, automatically unloading as quenching is completed. Because of such automaticity, a single operator handles the battery of three machines with ease. Productivity is estimated at 100 to 200 gears per hour depending upon size.

Although the company relies upon conventional methods of production, using familiar equipment such as Glea-



ACE
Drain-Tile Machine *employs* NOPAK Cylinder and Valves!

Precision molding of concrete drain tile on an Ace Machine is a simple, efficient, low-cost operation. The Model "A" NOPAK Air Cylinder raises the casing to charging position ... then retracts it at a *slow, controlled speed* while rotary polishing trowel puts a smooth, even finish on interior of the tile. Two NOPAK Flo-Trol Valves control cylinder speed . . . in both directions, to insure uniformity of repetitive work-cycles.

This is typical of many work-feed applications in which NOPAK Valves and Cylinders are used.

GALLAND-HENNING MFG. CO.
2774 S. 31ST STREET • MILWAUKEE 46, WIS.
Representatives in Principal Cities

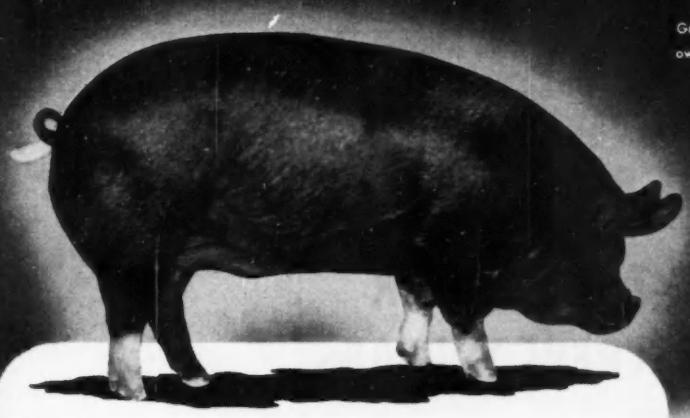
Arrows indicate location of NOPAK FLO-TROL VALVES

•

Write for Bulletin 100

NOPAK
VALVES AND CYLINDERS
DESIGNED for AIR and HYDRAULIC SERVICE

A 5786-½I-AA



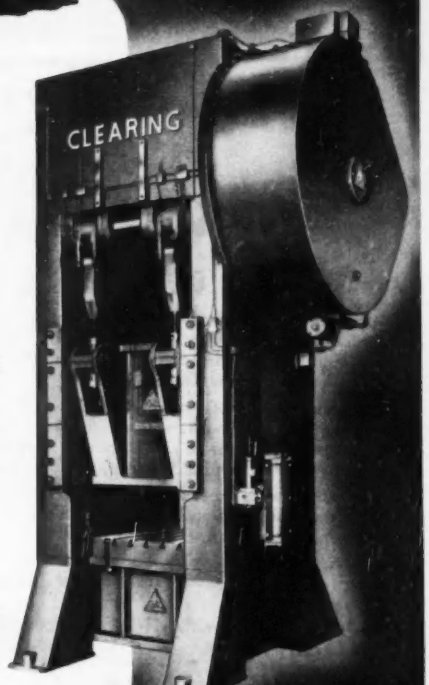
Grand Champion Barrow
owned by Ohio State University

Just another pig?

To the city dweller, a pig is a pig. But to the man whose income depends on pork production, the grand champion barrow pictured above is a very special pig indeed.

Though they don't get blue ribbons like pigs do, you can tell champion presses if you know how. In the highly competitive industries, where costs are closely watched and weighed, you'll find Clearing contributing most important press capacity.

That kind of "blue ribbon" is significant. It means dollars and cents to you if you're associated with industrial production. Before you specify or approve the purchase of any more equipment, ask us to supply you with the facts of real press economy.



CLEARING PRESSES

THE WAY TO EFFICIENT MASS PRODUCTION

CLEARING MACHINE CORPORATION

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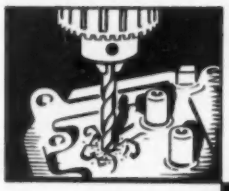
son generators, Fay automatic lathes, Bullards, G & E and Cleveland hobbers, Fellows gear shapers, Norton grinders, Heald internal grinders, etc., it has built an enviable reputation for quality and durability of product. Much of this is credited to quality control and the know-how of skilled workers who have been on the job continuously for many years.

The operator is supplied with the necessary gages and instruments to permit checking of the setup and continuous inspection of work turned out by his machine. In addition, a floor inspector is assigned to a group of machines and checks work at regular intervals.

Gear cutting operations are controlled by checking samples from each machine every hour. In addition, there is an excellent gear laboratory the function of which is to check all set-ups as well as to make a sampling check of all types of gears at regular intervals during the day. Among other equipment the laboratory uses a Red Ring gear speeder, a Red Ring gear checker, a Fellows Red Liner, and a Fellows involute checking machine with a chart recorder. It is of interest that the gear laboratory checks gears in the green as well as after heat treatment to cover the overall picture. Spiral and hypoid gear sets produced in the Gleason department are all routed to the Gleason laboratory where they are lapped and run-in in pairs to produce accurately matched sets. All helical and spur gears are shaved in the green on Red Ring gear shavers.

To complete the picture of quality control, all gages used in the shop are collected daily and returned to the gage and instrument booth where they are checked and calibrated before being used the following day.



RE-TREAD YOUR SCREW THREADS

and ELIMINATE DOWN TIME!

Stripped threads in crankcases, fuel pumps, engine blocks and other automotive components and accessories can be eliminated with Heli-Coil® Screw Thread Inserts.

Heli-Coil Inserts of stainless steel wire provide a hard, smooth, strong, non-corrosive thread protection . . . strongly resistant to abrasion, corrosion, wear, stripping, galling, and seizure.

Heli-Coil Inserts meet all S.A.E. standards . . . are made in the full range of National Coarse and Fine Thread Series . . . also in pipe thread and spark plug sizes.

For original equipment, for maintenance, salvage or repair, Heli-Coil Inserts are easily installed . . . thread protection is permanent!

Send the coupon for the Heli-Coil Design Data folder . . . no obligation, of course.

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Please send me a copy of your Design Data folder, No. 248.

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FIRM .....
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CITY ..... ZONE ..... STATE .....

Airbriefs

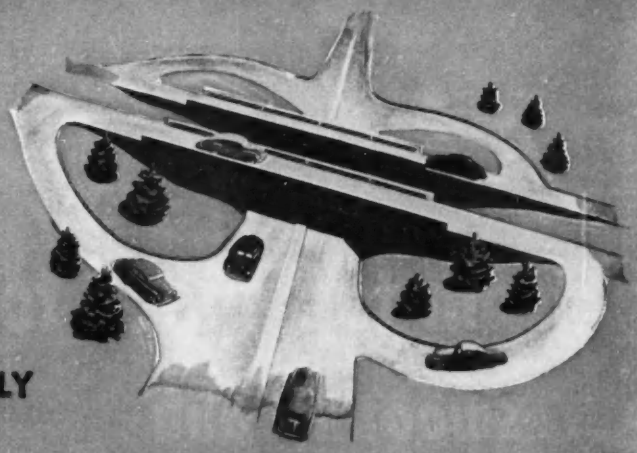
(*Continued from page* 52)

not true combatability. The F-80 has engaged in every fighter activity in the book in Korea except the one job it was designed to do: high-altitude interception. The jet fighter can do ground cooperation duties but only at an enormous waste of its capabilities. We have boasted long and loudly of how far ahead of the Russians we were in our jet fighter design and production but now the serious question looms—have the Russians been nearly as interested in the jet fighters as have we? They have gone about their business of producing enormous quantities of the "outmoded" Yak 7 and Yak 9 propeller fighters, which are ideal for close air support and patrol work. It is significant that one of the first carrier loads of aircraft dispatched to Korea was not jet fighters but a deck-load of Mustangs still in their "cocoons," the stripping operation being delayed until they arrived.

Where are the Missiles?

Five years is a long time to spend several million dollars annually on a project but such is the case of the guided missile. We think we should have something by now. But the best the Air Force could produce for its highly-publicized inauguration of its new Long Range Proving Ground (recently named Patrick Air Force Base, in honor of Maj. Gen. Mason M. Patrick, first chief of the Army Air Service), Cocoa, Fla., was a wartime German V-2 with a wartime U. S. "WAC Corporal" small rocket in its nose. The first launching fizzled in full view of dozens of reporters flown to the base especially for the demonstration. A week later the launching was successful and the "step" rocket shot up to 45,000 ft and a distance of 15 miles from the launching site. At this point the WAC Corporal was released and attained a speed of about seven times that of sound. The V-2 coasted to 52,800 ft, then dropped back to about 20,000 ft, where it was exploded and fell into the sea 48 miles

CONCENTRATION



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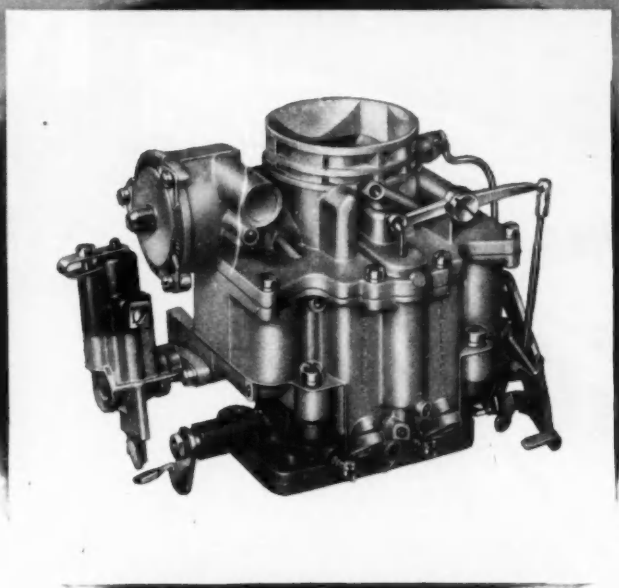

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for the finest carburetion

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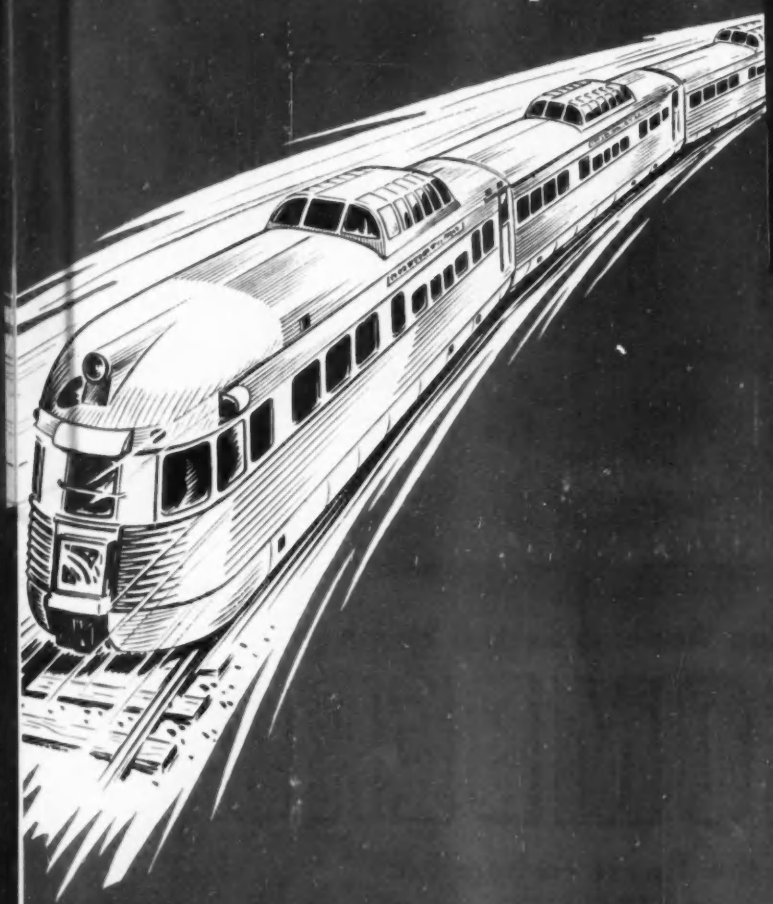
from top speed to full stop

...smoothly and economically...via



RM

FIRST IN FRICTION

The California Zephyr and several other leading trains throughout the nation are now operating with an advanced type of brake system.

It is the Budd Disc Brake . . . the first basic improvement in railroad braking since the invention of the air brake. How fast does it operate? Here's an example. *With disc brakes, in which R/M friction materials play a vital part, an 80-ton car can be brought from 100 m.p.h. to full stop in less than half a mile!*

All this is done quietly and smoothly, without squeals or screeches, without jerks or jars. And with vast savings in maintenance costs!

Time and again, in railroad as well as in automotive and industrial applications, R/M has helped pioneer far-reaching improvements in brake and clutch operation. The experience thus gained, plus the facilities of the world's largest producer of friction materials, is at your service when you call in your R/M representative.

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Fan Belts • Radiator Hose • Mechanical Rubber Products • Rubber Covered Equipment • Packings
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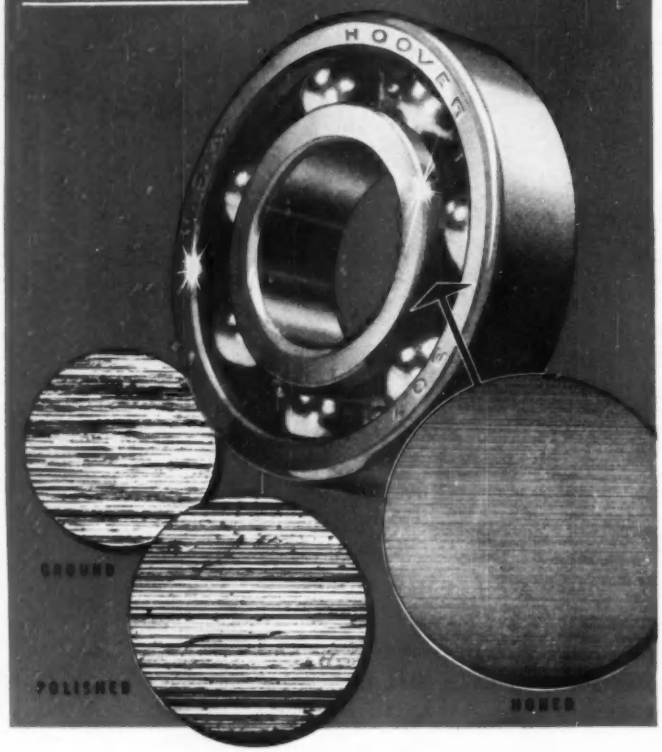
You can see the difference in
HONED RACEWAYS



exclusive with
HOOVER BALL BEARINGS

The photographs reproduced above are magnified one hundred times so you can see the difference between ground, polished and honed raceways. The process and the special machines for the honing operation are exclusive, patented, Hoover developments. Honing by Hoover goes far beyond grinding and polishing to achieve a surface that assures amazing quietness plus *90 per cent longer bearing life . . . 30 per cent greater load capacity.* That's why Hoover Ball Bearings are the choice of distinguished American manufacturers of fine machines and equipment.

The Hoover Engineering Manual will be mailed free to engineering and purchasing executives requesting a copy on their business letterhead.

THE ARISTOCRAT OF BEARINGS

HOOVER BALL and BEARING CO.
Ann Arbor, Michigan

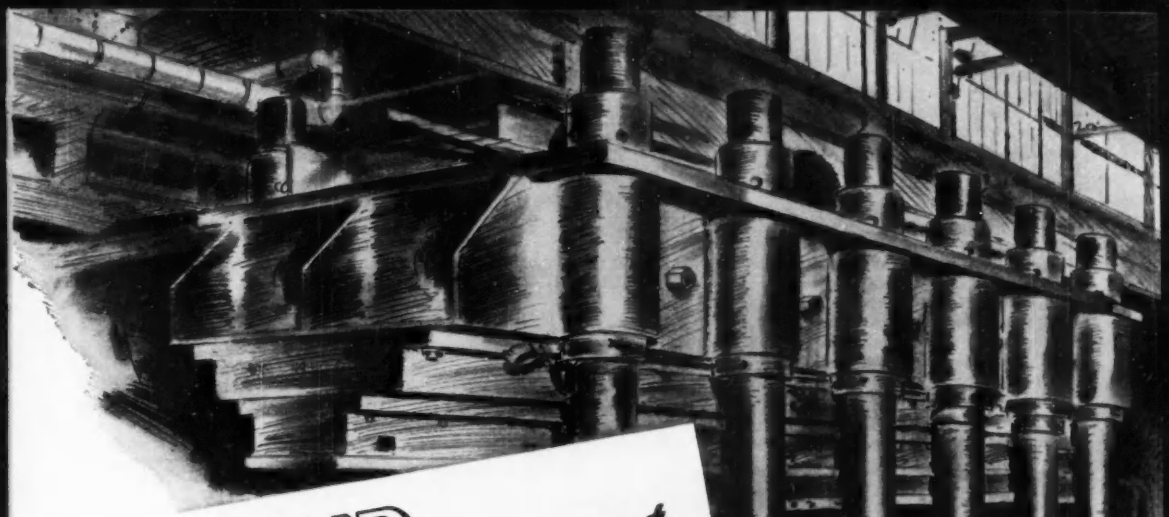
from the launching site. The V-2 weighs 28,700 lb and carries a 1000-lb warhead. The WAC Corporal weighs a mere 70 lb and carries no useful load. Presumably the 1000-lb load of the V-2 could accommodate an atomic bomb—we don't know—but certainly the WAC Corporal could carry nothing destructive. Thus, eight years after the Nazis launched their V-2 it is our deadliest missile. Granted that guided missile problems are tough, particularly those of obtaining a usable range, but many, many minds and millions of dollars have gone into the problem in the past five years and we still haven't anything ready for combat.

That Merger

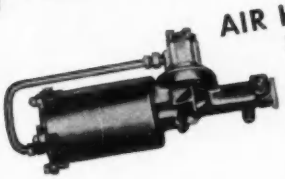
We seriously doubt that there has ever existed a more involved legal-financial-political tangle than that surrounding the sale of American Overseas Airlines to Pan American Airways. It sounds like a simple deal, the purchase of one company by another, but personalities and the White House became involved and that made it a mess. The argument seems to be simply an anti-Juan Trippe campaign, rather than the merits of the case. Trans World Airlines, which opposed the merger for no very clear reason other than the fact that it would make TWA the sole competitor of PAA across the Atlantic, hired ex-presidential aide Clark Clifford to represent its opposition with the president. It now appears that President Truman, who must approve all overseas airline deals, signed the order approved by the Board which turned down the sale. Now comes talk of erasure of the presidential signature from the order, the resignation of CAB Chairman O'Connell, visits with the President by Clifford at Key West and the White House, and the decision of the President to approve the sale provided TWA gets London and Frankfurt stops in exchange for PAA's purchase of Paris and Rome stops. This means that each of the contestants will receive the two choice stops of the other, making the battle more of a farce than a business deal. Over all these shanigans is thrown the curtain of "the public interest," a travesty of the first water. As time goes on Americans are learing that "regulated competition" is not the middle ground between our old-fashioned free-enterprise system and pure socialism, as it has been represented. Regulated competition is another word for bureaucratic favoritism and that is the smelly side of socialism.

Quick-change Artists

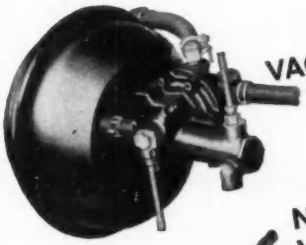
The Air Force powers-that-be took one quick look at the Korean situation and hastily asked the industry for a turboprop-powered tactical support aircraft capable of 500 mph, a ceiling of 45,000 ft and a 2500-mile range while carrying all the cannon, rockets and



MIDLAND
Power Brake Equipment
AIR and VACUUM



AIR HY-POWER. Newest Air-over-hydraulic design. Fine graduation and real pedal "feel". Distributors report from 5 to 7 hours saved in installation time, due to elimination of foot control valve—power chamber cluster—moving of master cylinder—removing brake pedal—foot valve connecting linkage. Less tubing! Fewer parts!



VACUUM HY-POWER. Direct applied power for positive braking. Furnished in sizes to suit the vehicle. Complete kits for all makes and models from 1/2 ton up.

NEW VACUUM HAND CONTROL VALVE. More compact! Lighter weight! Perfect control! And with eye appeal! Integral bracket. With or without gauges (Frostline dials—luminous hands.)

When "Might Makes Right!"

Monstrous equipment in Midland's Cleveland and Detroit plants—tremendously powerful—capably operated—backed by skilled engineering—guarantees that products made by Midland are "right!"

See the MIDLAND Distributor near you, or write to us for complete information.

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Air and Vacuum POWER BRAKES

World's Largest Manufacturer of AUTOMOBILE and TRUCK FRAMES

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bombs it could lift. After spending five years on intercontinental bombers and defensive jet interceptors, while ignoring the constant pléas of the Army Ground Forces, the Air Force has suddenly faced the fact that close air support is the factor that wins battles. This lesson of World War II is scattered throughout the history of that conflict. One of its foundation stones was General Hoyt S. Vandenberg himself, whose 9th Tactical Air Force worked under close orders from General Patton's tanks and smashed across Europe leaving destruction everywhere. But such an airplane is three years away from combat.

Mazda standard truck. A passenger car body also is available on the same chassis.

Japanese Mazda Light Truck

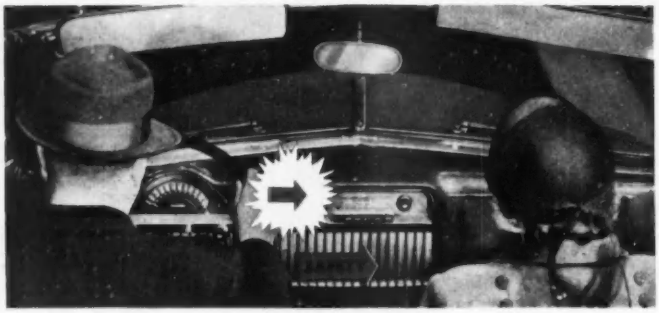
BECAUSE of their adaptability to the winding, narrow roads of Japan, three-wheeled trucks are favored by users in that country. In order to keep costs down and to provide an efficient vehicle for transportation of light loads, designers have concentrated on this type, and about ten companies now are making these three-wheeled vehicles. Production in 1949 exceeded expectations when 30,000 units were completed —6000 more than the number originally planned.

Bodies are available in standard and large sizes. Single-cylinder engines are used but may be replaced in the near future by two-cylinder units for vehicles equipped with large bodies.

Powered by a single-cylinder, 15-hp engine, the Mazda truck illustrated is said to transport a load of 1100 lb in a standard body that is 50 in. long, 43 in. wide and 18 in. deep. Maximum speed is 37 mph. Total length, width and height are respectively 109 in., 47 in., 47 in. The rear wheel tread is 42 in. and the wheelbase is 70.7 in.

BOOKS . . .

MOTOR OILS AND ENGINE LUBRICATION, by *Carl W. Georgi*, published by *Reinhold Publishing Corp.*, 330 W. 42 Street, New York, N. Y. Price $8.50. Practical problems of engine usage, maintenance and lubrication, as well as causes and remedies affecting operating troubles are described in this book. It covers at length the methods of testing and evaluating performance characteristics of motor oils. Particular emphasis is laid upon viscosity index and its importance in all phases of motor lubrication. Detailed specifications covering various types of engine tests, properties of lubricants, and all types of performance ratings are included. The book is primarily for lubrication engineers, service engineers, engine designers, maintenance superintendents, and the service and sales departments of oil companies.



Every flash of the Pilot Light Spells—

SAFETY

SAFETY

SAFETY

SAFETY

A perfectly functioning direction signal on an automobile is a tremendous safety factor, both to drivers and pedestrians. But, let a light burn out, or other failure occur unknown to the driver, and safety instantly becomes a hazard.

That is why all automotive signal systems should include TUNG-SOL Flashers. The TUNG-SOL Flasher when properly installed provides the important instrument panel pilot light plus the advantage of instant starting. Its blinking action is assurance that the signal is functioning properly. Its failure to flash means trouble in the system.

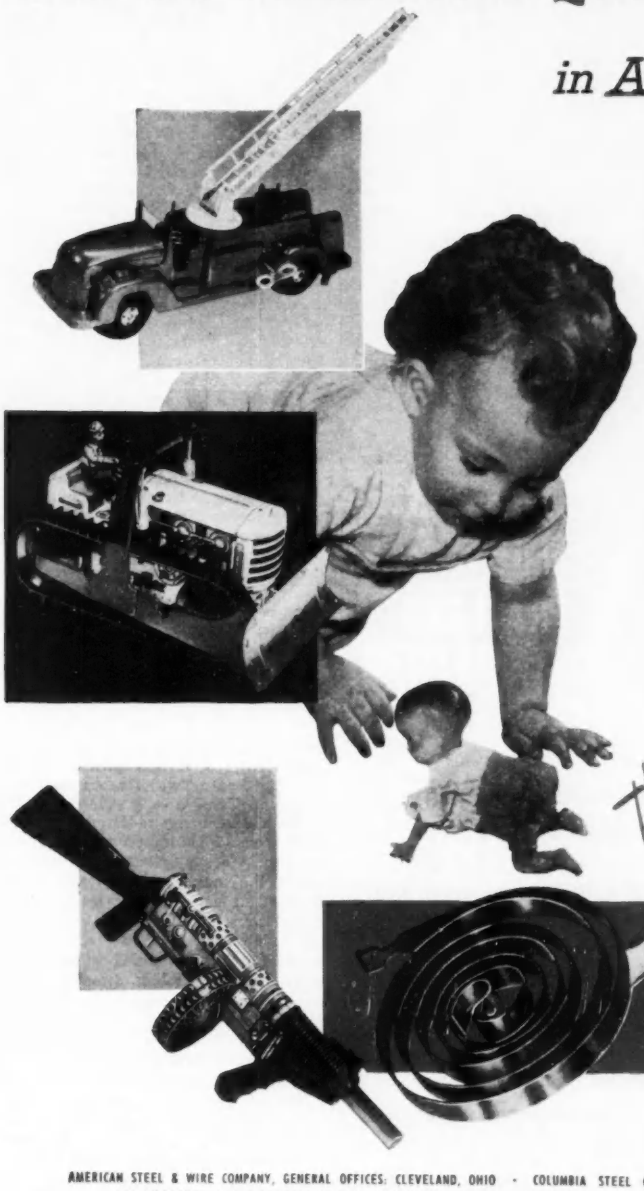
Nearly 10,000,000 TUNG-SOL Flashers have been bought since 1939. The TUNG-SOL Flasher is now standard or optional equipment on virtually every American made automobile. It normally lasts for the life of the vehicle, consumes little current and requires no maintenance. *Write for more information.* TUNG-SOL LAMP WORKS INC., Newark 4, N. J. *Sales Offices:* Atlanta, Chicago, Dallas, Denver, Detroit, Los Angeles, Newark.

TUNG-SOL SIGNAL FLASHERS

ALSO AUTO LAMPS, ALL-GLASS SEALED BEAM LAMPS AND ELECTRON TUBES

Here are American Quality Springs

in Action!



● Springs are the very heart of most toys for children. But what a beating they have to take.

Toy springs are wound to the limit, countless times a day. They're *overwound*. Even wound *backwards*. All but the best springs give mighty short service.

We make these rugged springs for many toy companies . . . and they stand up. But that's not all we do. American Steel & Wire makes springs for locomotives, alarm clocks, tractors, typewriters — everything, in fact, that needs good springs . . . well designed . . . carefully manufactured.

Take advantage of our wide experience, our unequalled research and testing facilities, our most modern production equipment. For expert engineering assistance and further information, write: American Steel & Wire Company, Rockefeller Building, Cleveland 13, Ohio.

The spring's the thing!

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USS **AMERICAN QUALITY SPRINGS**

UNITED STATES STEEL

Detroit Viewpoint on Conversion

(*Continued from page 33*)

that these are nothing but speculation, are in terms of a 10 to 20 per cent reduction. Even if they should come about and the industry could produce at a 80 per cent rate, production still would be far ahead of any prewar level. It is estimated that military commitments made thus far would at best require only 10 per cent of total steel output. So the chances are that automobile and truck production will remain at a rather high level for the immediate months ahead.

One factor which is much different from what it was when the industry converted in 1942, is that today as a result of a great wartime and postwar expansion, the number of plants and the capacity of production facilities is very much greater than it was prewar. Actually, in event of a total war effort, there should be no great rush of new plant construction such as characterized preparations for World War II production. Many of the government war plants have been sold to private industry, but still would be available for war use either under recapture clauses or through voluntary action by the present owners. A case in point is the Kaiser-Frazer Willow Run plant. In the event of an emergency, K-F has 120 days to signify its intent to comply with a government request to use the plant for a specific purpose. Actually, the stipulation is an academic one since K-F, like all automobile companies, would most certainly be ready and willing to do its share in any war effort. The aircraft building at the Ford Rouge plant, which the company has purchased since the war, has no recapture clause, but it goes without saying that Ford would put the plant to any use the government requested in a war emergency.

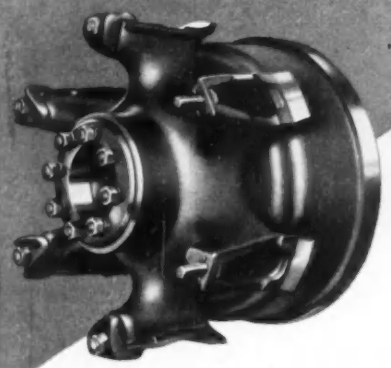
There are, in addition, several large plants operated by the automobile industry during the war that could again be taken over for war production. The huge Dodge-Chicago plant, in which the ill-fated Tucker venture was housed, still is owned by the government as is the Lustron plant. The large Chrysler Tank Arsenal again is humming with activity, so apparently it will not be a question of facilities but rather one of tooling if and when an all-out war effort comes.

Since the end of the war military officials have been cooperating with the industry in what is known as Phase One and Phase Two of a preparedness program. These involve studies of each individual company to determine what it best could manufacture in case of war and placing "phantom" orders on which the manufacturers could start work at a moment's notice with formal negotiations and actual contract signing to be done later. It is conceded, however, that it would take many months to get tooling completed and production actually rolling, which lends further support to the belief that there will be no immediate interruption of motor vehicle production.

What each individual company would produce in the event of partial or total war production is confidential at the moment, but it is a logical assumption that they probably would again build those products in which they had experience in World War II. There would, of course, be some variation because of changed circumstances since the end of the war. For one thing, airframe construction logically would be channeled first into the greatly expanded facilities of the regular aircraft builders and quite possibly would not be given to automobile manufac-

GUNITE CAST STEEL WHEELS

STRONGER...LIGHTER



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TUBULAR-SPOKE, CAST ELECTRIC-STEEL WHEELS offer you maximum strength...minimum unsprung weight

More and more automotive engineers are demanding the advantages of GUNITE Wheel Assemblies for trucks and trailers. The GUNITE Wheel offers light-weight design with the proven strength and rigidity of cast electric-steel. The GUNITE Rugged Brake Drum prevents brake troubles, provides more efficient braking and offers lower cost per mile. These two together form the GUNITE Wheel Assembly which is available to fit most standard truck and trailer axles.

WRITE FOR GUNITE WHEEL INFORMATION

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Gunite (Processed Gray Iron) · Malleable · Electric-Steel

Brake drums, cylinder liners, cam shafts, crank shafts and other automotive castings are made to your specifications. GUNITE provides you with castings of the best ferrous material to fit your requirements.

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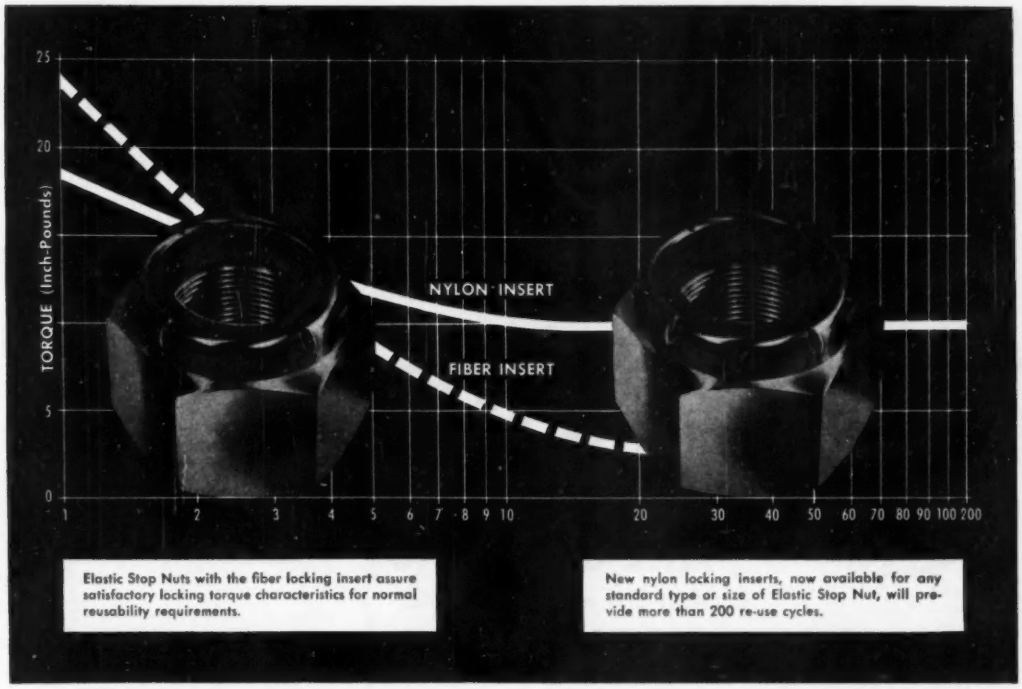
TORQUE (Inch-Pounds)
25
20
5
0
NYLON INSERT
FIBER INSERT
1 2 3 4 5 6 7 8 9 10 20 30 40 50 60 70 80 90 100 200
Elastic Stop Nuts with the fiber locking insert assure satisfactory locking torque characteristics for normal reusability requirements.
New nylon locking inserts, now available for any standard type or size of Elastic Stop Nut, will provide more than 200 re-use cycles.

How do you measure Reusability?

UP TO FIFTEEN TIMES?

For assemblies that must be locked in place, Elastic Stop Nuts with fiber locking inserts guarantee a permanently secure grip—plus ample reusability to cover most normal maintenance requirements.

For assemblies that must be disassembled and reassembled five, eight, ten, or more times during normal use, fiber insert Elastic Stop Nuts make the ideal self-locking fastener.

When an Elastic Stop Nut is run on a bolt, the Red Elastic Collar hugs the bolt—actually makes a skin-tight fit against the entire contact length of the threads—and this controlled torque firmly resists vibration or shock. When the Elastic Stop Nut is removed from the bolt, the natural resiliency of the Red Elastic Collar is your guarantee of continuing torque when the nut is reapplied.

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Now, for assemblies that require constant adjustment or frequent disassembly for checking and maintenance, ESNA offers all standard types and sizes of Elastic Stop Nuts with the new nylon locking inserts.

Reusable up to 200 times with remarkably constant torque characteristics, these new Elastic Stop Nuts offer the one-piece construction, the shock resistance, and the moisture-seal features that many manufacturers now depend upon in the standard Elastic Stop Nuts.

One of these Elastic Stop Nuts is probably the solution to your most troublesome fastener problem. It will pay you to look into the self-locking performance of Elastic Stop Nuts. For information, write for a new, free booklet. **Elastic Stop Nut Corporation of America,** 2330 Vauxhall Road, Union, New Jersey.

ESNA
TRADE MARK

ELASTIC STOP NUTS

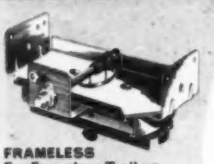
OVER 450 TYPES AND SIZES IMMEDIATELY AVAILABLE FROM STOCK

turers until all existing aircraft facilities were loaded to the limit. The automotive industries during the last war turned out hundreds of different items entirely foreign to their usual products. (See tabulation.) It is quite likely that an allout war commitment again would see them building the same items.

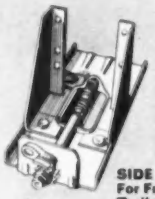
Another interesting speculation is whether or not the government would order a complete stoppage of motor vehicle production in the event of total war. Truck production, of course, would be continued in a limited amount and there is some belief that with passenger cars so vital to the economy, curtailed production might be continued.

Meanwhile, the effect of the Korean war on the automobile industry has been to bring back the choatic imbalance between supply and demand that existed in 1946 and 1947 along with all of the attendant evils. Reports of accessory loading, under allowances, and other bad practices among dealers again are heard on every hand. Despite record high production, panic buying has swept dealer inventories clean and in some instances dealers are refusing to take orders. If stringent credit controls are reimposed, however, and production stays near where it is now, the situation undoubtedly will be eased because many low income buyers would be driven out of the market. Used car prices and demand also have shot sharply upward since the start of the war. Some new and used car dealers are very uneasy about the possibility of a bad market break in the event the military campaign in Korea suddenly takes a turn for the better. Used car dealers particularly report that demand is very sensitive to military headlines.

CABLE LIFT TIRE CARRIERS



FRAMELESS
For Frameless Trailers



SIDE MOUNT
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NASH
TIRE CARRIERS
CABLE LIFT and SLANT BASKET
For All Trucks And Trailers

One single highly specialized source provides you with the proper type of carrier for your vehicle. Light in weight, rugged in construction, Nash Tire Carriers are recommended for either original equipment or replacement.

Write for bulletin.

SLANT BASKET TIRE CARRIERS

For Tank Trailers

For Frame and Frameless Trailers

NASH BODY-GARD BUMPERS
Custom built from Hi-Tensile Steel. Economically Priced. Prompt Delivery. Choice of Regular Form, Full Form or Wrap Around—5 Face Widths. Write for folder describing our complete bumper service.

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Air Force to Build All-Magnesium Plane

An all-magnesium-alloy airplane is now in the planning stage by the Air Force, according to a report of the Air Materiel Command's Aircraft Laboratory. The construction of such a plane is considered practical because of the successful application of magnesium to structural components, especially in tests on the wings of the Lockheed F-80 fighter. These wings, made entirely of magnesium-zirconium alloy, employ a thick, unreinforced skin as surface covering in place of the conventional stringer-reinforced, thin-skin type of construction.

The new type of wing has already undergone extensive static tests and has been test-flown on the F-80 for a total of 120 hr without showing any adverse structural characteristics. Although its skin is more than seven times as thick as that of the conventional wing, the magnesium wing is believed better because very few internal reinforcement—stringers and chordwise formers—are needed to prevent buckling at high loads. This leaves considerably more space for fuel tanks. As a result, the improved wing and greater fuel load increase the range of the F-80 by approximately 30 per cent, based on the wing alone. Only about 35 per cent of the detailed parts and fastenings used in conventional wing construction are employed in the new magnesium wing.

Prior to the use of magnesium in the experimental F-80, the alloy, coated with a zinc-chromate primer and painted with a suitable lacquer, varnish, or enamel, was used in the construction of the North American T-6 trainer. Protected by the coating, T-6 components made of magnesium were flown under severe climatic conditions without showing any bad effects.

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AUTOMOTIVE INDUSTRIES
Regularly and Thoroughly

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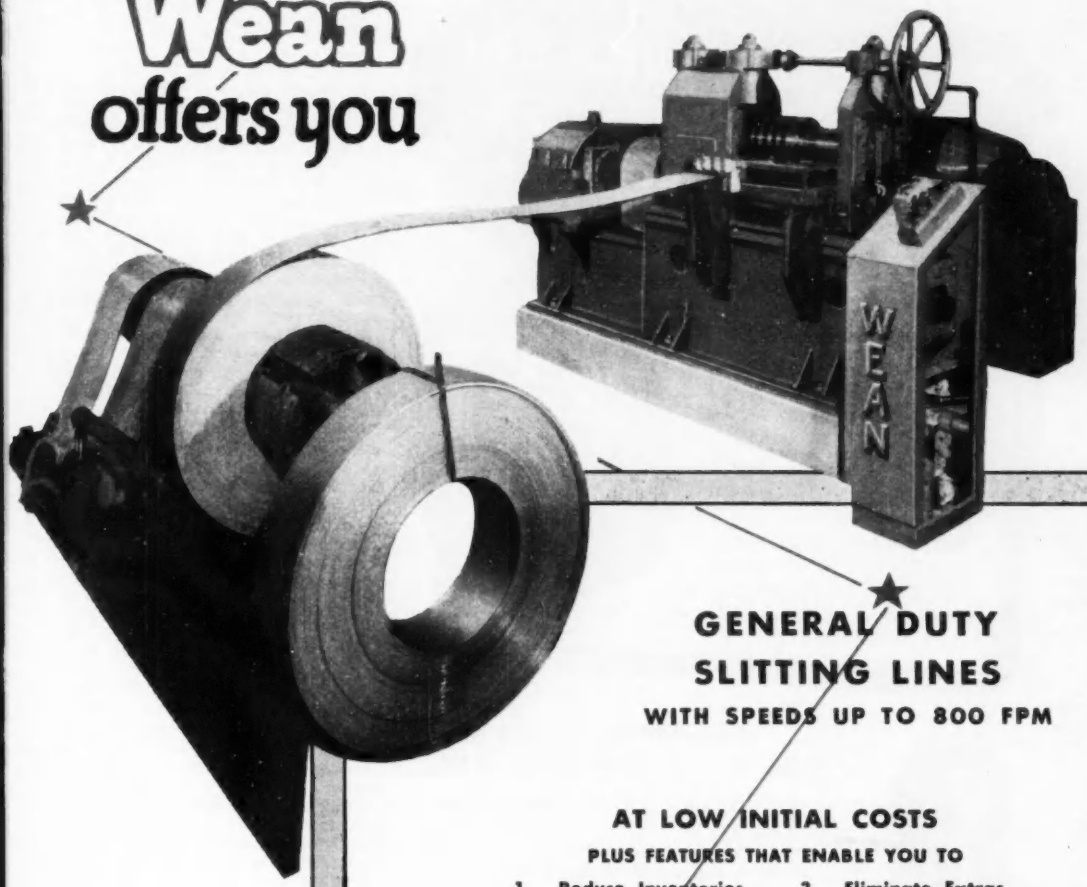

GENERAL DUTY SLITTING LINES

WITH SPEEDS UP TO 800 FPM

AT LOW INITIAL COSTS

PLUS FEATURES THAT ENABLE YOU TO

1. **Reduce Inventories**
2. **Cut Labor Costs**
3. **Eliminate Extras**
4. **Minimize Maintenance Costs**

IF you are in the business of handling strip steel or fabricating steel parts or products from strip steel you should give your slitting operation high consideration. Well designed slitting lines enable you to reduce inventories, lower labor costs and eliminate extras. Wean engineered slitting lines give you these important factors at lowest initial costs.

If you have a slitting problem — or merely desire a check on the efficiency of your present operation — call in Wean specialists.

Wean

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CLEVELAND, OHIO

SKILSAW CUTS DOWN-TIME AND TOOL GRINDS 75% with Stuart's SPEEDKUT

MATERIAL: Stressproof No. 2

MACHINE: Acme Gridley 2" RB-6

SPEED: Spindle speed 443 (116 pcs. per hr.) Surface feet 123

FEED: Form Tool .0012 (.499 core drill .0064 feed)

TOOL LIFE: 12 hours between grinds

CUTTING FLUID: 1 part SpeedKut B to 6 parts paraffin oil

COST APPRAISAL: Savings resultant equal 75% less machine down-times; also 75% less tool grindings

NOTE: Machine is now made available to more production within its capacity.

Worm after broaching eight splines on an American vertical pull-down broach.

Hobbing of the worm is performed on a Barber Colman No. 16-16 gear hobbing machine in one pass.

MULTI-PURPOSE CUTTING FLUID SAVES ON MACHINING WORM GEARS

THE FIGURES above speak for themselves. Skilsaw, Inc., noted as being one of the most progressive and cost-conscious manufacturers in the metal-working field, selected Stuart's multi-purpose SpeedKut B for three operations (automatic screw machine, spline broaching, hobbing) on worm gears after placing it in direct competitive tests with other cutting fluids. SpeedKut B is applied straight on the broach while a 6 to 1 dilution is used on the other two operations.

Probably no single element in machining presents as great an opportunity for cost reduction and fuller utilization of the productive time of expensive machine tools as does the cutting fluid used.

Your Stuart Representative's business is COST REDUCTION. Ask him to call and show you how he can help you.

WRITE FOR D. A. Stuart's booklet, "Cutting Fluid Facts" . . . a guide to better machining.

D. A. Stuart Oil Co. LIMITED

EST. 1865

2733 S. Troy St., Chicago 23, Ill.

Automatic Transmissions

(*Continued from page* 46)

losses, as shown in Fig. 3. With increase in runner speed, the velocity of the runner discharge decreases, and so does the reactor entrance angle. At the design point, the fluid enters the reactor parallel with its vane surfaces and the shock losses vanish. Beyond this point the fluid has a forward velocity at the runner exit and impinges against the backs of the reactor vanes. In a converter with fixed reactor the angle at which the fluid enters the latter becomes very large at top speed, and the shock losses mount correspondingly.

In the Dynaflow, as soon as the direction of flow is such that there is a slight pressure on the backs of the vanes of reactor I, that member begins to freewheel. Thereafter the shock loss is determined by the angle which the direction of flow makes with reactor II. When reactor I begins to freewheel, the fluid still impinges on the forward or concave side of the vanes of reactor II, and this causes some shock loss, but presently it begins to impinge on the backs of the vanes, and reactor II then also begins to freewheel. From that point to the end of the speed range there is coupling action; the output torque is equal to the input torque, and the efficiency rises with increase in runner speed. Fig. 5 shows the change in the direction of flow relative to the reactor vanes of the Dynaflow, from stall to top speed, as well as the directions of flow when reactors I and II begin to freewheel, respectively.

While at the entrance to the impeller and reactor the direction of flow varies greatly with runner speed, at the entrance to the runner it changes comparatively little. At stall both the flow velocity and the relative whirl velocity at the runner entrance are high; the first because the runner then develops no counter centrifugal force, so that the whole of the centrifugal force engendered by the impeller is available for overcoming flow resistances; the second because with the runner at rest the speed difference between it and the impeller is great. These conditions result in a definite direction of flow, and the runner vanes, of course, can be shaped or set to suit that flow, provided the direction does not change too much with runner speed. As this speed increases, the flow velocity decreases, but so does the whirl velocity, hence the ratio between the two, which determines the direction of flow, is nearly constant. With only small changes in the direction of flow, and an optimum vane angle, shock losses at the runner entrance are small throughout the speed range, as shown by the lowest of the shock-loss curves in Fig. 3.

When the efficiency of the Dynaflow under full engine load is plotted against the car speed, we obtain the

(*Turn to page* 104, *please*)

(Advertisement)

COPPER ALLOY BULLETIN

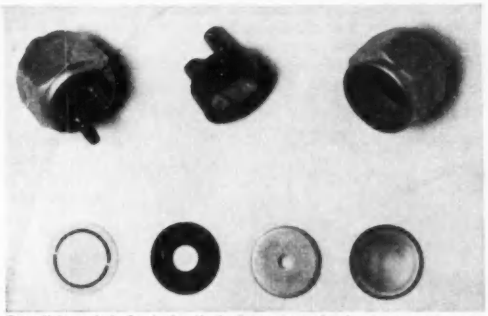
REPORTING NEWS AND TECHNICAL DEVELOPMENTS OF COPPER AND COPPER-BASE ALLOYS

Prepared Each Month by BRIDGEPORT BRASS COMPANY "Bridgeport" BRASS CO. *Headquarters for BRASS, BRONZE and COPPER*

Phosphor Bronze Vital to Switch

Stop light switches for cars with hydraulic brake systems use phosphor bronze and free turning brass for both electrical and mechanical applications.

This unit is expected to operate for a considerable period of time without attention or maintenance.



Stop light switch for hydraulic brake system, showing component parts. Courtesy Fasco Industries Incorporated, Rochester, N. Y.

When brake pressure is applied, oil is forced against a composition rubber diaphragm, applying pressure to a phosphor bronze diaphragm which in turn closes a phosphor bronze switch leaf, making electrical contact. When the brake is released, the bronze diaphragm acts as a cricket, snapping back to open the switch by combatting the residual pressure of the hydraulic system.

Due to the countless making and breaking of contact of the switch in the normal use of a car, spring temper phosphor bronze was selected because of its exceptional resistance to fatigue.

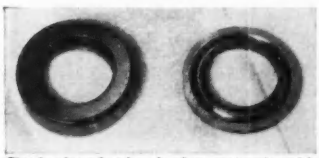
Free cutting brass rod is used for the terminal pins because of its machinability and ability to withstand corrosion from moisture and petroleum oils.

Bronze Ferrule Increases Life of Clutch Bearing

Commercial bronze ferrules are used in the illustrated clutch release bearing to prevent leakage of grease and entrance of dirt into the bearing.

Although the ferrule has no part in the function of the bearing, it may be subject to some wear if it comes in contact with the carrier sleeve after the clutch fingers release the clutch pressure from the bearing.

Commercial bronze (90% copper, 10% zinc) was selected because it has greater wear resistance and is stronger than copper, yet approaches it in workability.



Clutch release bearing showing construction with commercial bronze ferrule made from strip stock—Courtesy Bearings Co. of America, Lancaster, Pa.

The strip bronze is cut to length, then the metal is flanged. Since high copper alloys do not work harden as rapidly as the lower ones such as high brass, stresses are where the metal is doubled back on itself.

The pre-lubricated bearing is an important change in clutch bearing design. Often this point of lubrication was omitted, thereby reducing the bearing life. Several hundred thousand operations are expected of this bearing, which represents many years of life. Not only is relubrication unnecessary, but one fitting is eliminated in the construction.

Copper Wire, Tube, Sheet Used in Electric Motor

Copper wire, sheet and tube as well as free machining brass rod are an integral part of the illustrated 110-volt, 60-cycle induction motor.

Enameled copper wire is used for the windings of the stator which set up the magnetic fields. As a means of concentrating the magnetic flux in these fields, extruded and drawn rectangular copper tube is cut into sections. Two pieces are inserted opposite each other in the laminations as shading bands.

In the rotor, two blanked and pierced copper washers are used as shorting rings. Cold-headed copper pins are inserted through these discs and laminations and both ends are copper welded.

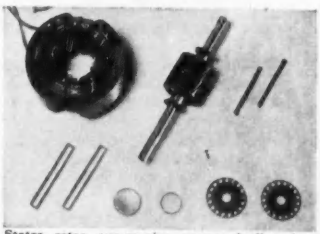
Two free machining brass bushings are used as spacing elements between the rotor ends and the bearings.

Three main types of copper are commercially available:

Electrolytic tough pitch is used for bus bars, conductivity wire, switches, terminals, contacts, etc. It contains a small quantity of copper oxide and its conductivity is set at 101%.

Deoxidized copper has a conductivity of 85% and is used for various tube applications. In the sheet form, it is suitable for operations where extra deep draws and flanging are required.

Oxygen-free copper has an exceptionally high ductility and the highest electrical conductivity of the three types mentioned. Where a high degree of electrical efficiency is necessary, this metal is normally utilized.



Stator, rotor, copper pins, copper shading rings and shorting discs in induction motor—Courtesy Fasco Industries Incorporated, Rochester, N. Y.

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MILLS IN
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graph shown in Fig. 6. It comprises sections of individual curves, each of which corresponds to a separate regime or mode of operation of the converter. The first section of the efficiency graph corresponds to that condition of operation where the auxiliary impeller freewheels. At the first junction between individual curves, freewheeling of the auxiliary impeller stops; at the second, reactor I begins to freewheel, and at the third, reactor II follows suit. Beyond that point the unit acts as a fluid coupling.

On an average road the engine does not carry a full load until a very high road speed is attained, and at the so-called road load at lower road speeds the converter efficiency is higher than at full engine load at the same speed. A curve or graph of road-load efficiency also is shown in Fig. 6. Efficiency and torque ratios of Dynaflow, typical converter, and typical coupling are shown by the curves in Fig. 7. From the road-load efficiency curve of Fig. 6 it can be seen that the efficiency is above 90 per cent from about 15 mph on. Road-load, of course, means the engine load on level road at the particular speed.

We next pass on to the planetary low-speed-and-reverse gear, of which a cutaway view was shown in Fig. 1. A driving sun gear splined to the converter output shaft meshes with three intermediary pinions of about twice its width, which in turn mesh with three others, referred to as reverse pinions. Both sets of pinions are supported on shafts secured into the planet carrier, which is the driven or output member of the unit. The reverse planet pinions mesh with both a low-range reaction gear and a reverse ring gear. Either of these two gears can be held from rotation by the application of a friction band to a drum. Fig. 8 is a diagram of one-half of the planetary assembly, looked at from the rear. The drive pinion turns left-handedly, the intermediary pinion right-handedly, and the reverse pinion left-handedly. When the low-range reaction member is held from rotation by its friction band, the reverse pinion, rolling on the low-range reaction member, causes the planet carrier to revolve in the same direction as the drive pinion, at a reduced speed. The reduction ratio under these conditions is given by the equation

$$\frac{\text{No. of reaction-member teeth}}{\text{No. of drive-pinion teeth}} + 1,$$

and in this case we have

$$\frac{23}{28} + 1 = 1.82$$

When the ring gear is held from rotation by its friction band, as shown in Fig. 9, the drive pinion, intermediary pinion, and reverse pinion all turn in the same direction as for low forward gear. But the reverse pinion now rolls on the ring gear, instead of on the low-range reaction member, and causes the planet carrier to turn in the opposite direction to that of the drive pinion. Under these conditions the speed ratio is given by the equation

$$\frac{\text{No. of ring-gear teeth}}{\text{No. of drive-pinion teeth}} - 1,$$

and in this case we have

$$\frac{79}{28} - 1 = 1.82$$

Thus the reduction ratio is the same for both the emergency low speed and the reverse.

The planetary assembly also includes a friction clutch which locks its members together for a direct drive. This clutch, shown in section in Fig. 1, is of the multiple-disk, wet type. The member serving as pressure plate for the clutch also functions as the piston of the hydraulic cylinder by means of which the clutch is engaged.

The hydraulic control system of the planetary assembly, of which a schematic drawing is shown in Fig. 10, makes use of two internal-external gear pumps, one located at the forward, the other at the rear end of the transmission housing. The forward one is driven from the engine through the main impeller of the converter, while the rear one is driven from the transmission final-drive (planta-carrier) shaft. The rear pump is needed because it must be possible to provide hydraulic pres-

(*Turn to page* 106, *please*)

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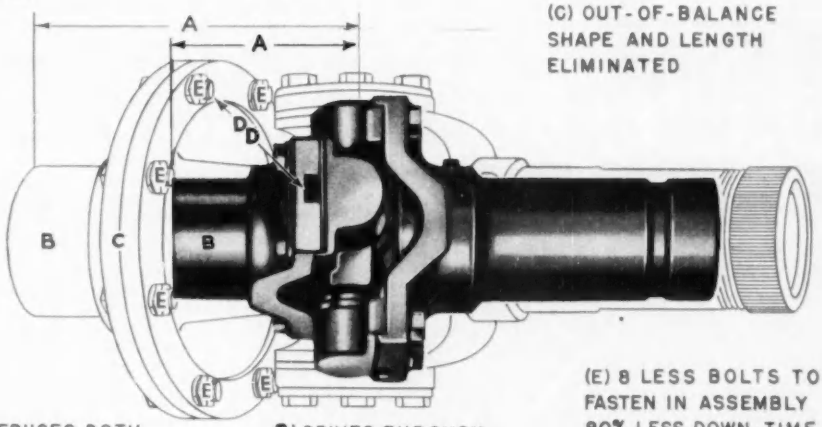

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sure for the control of the transmission when the battery is low and the engine has to be started by pushing or pulling the car. Both pumps draw from the sump of the transmission housing, and the delivery sides of both are connected to the same control units. To prevent one pump from working against the other, a check valve is inserted in the delivery line of each. If a push start should be required, the car is brought up to about 15 mph with the control lever in neutral. When this speed has been reached, the lever is shifted to low, and the rear pump then furnishes the hydraulic pressure necessary to engage the direct-drive clutch.

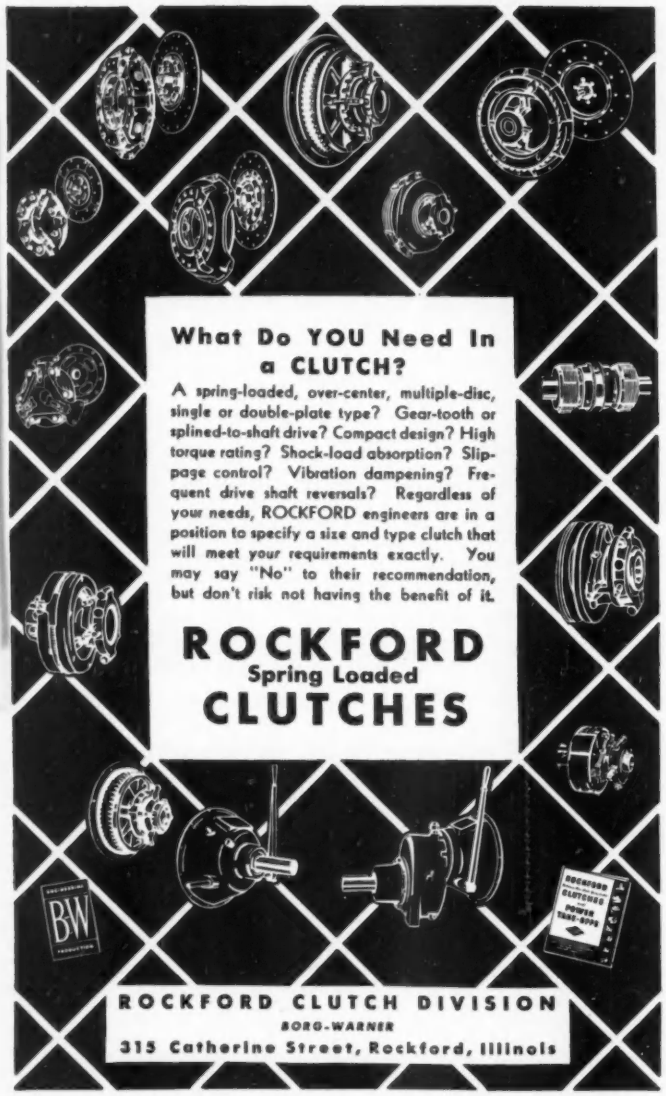
When the car is first started, the forward pump furnishes the required hydraulic pressure, however, the rear pump soon begins to take over part of the load, and from 45 mph up it carries the whole load. The pressure developed then opens a bypass valve through which the oil moved by the forward pump returns directly to the sump, allowing that pump to idle. Because the rear pump has to supply the hydraulic control system only at high car speeds, it can be relatively small.

There are two valves with multiple connections in the control system. Of these the manual valve is linked to the control lever on the steering post, and through it hydraulic pressure can be admitted to power cylinders or servos which apply the low-speed and reverse friction bands, and to the power cylinder of the direct-drive clutch. The friction bands are provided with linings of bonded metallic material. The pressure regulator valve, of which a sectional view is shown in the upper part of Fig. 10, performs a number of different functions: It controls the pressures applied to the various units of the planetary assembly, and also the output of the two pumps; and in addition it keeps the oil in the torque converter under pressure in operation—to prevent cavitation and resulting losses.

The reverse friction band has a fixed anchor and, as shown by the sketch at the lower right in Fig. 10, is applied by means of a bell crank having its fulcrum on the anchor pin, one arm of the bell crank being acted on by a piston in the power cylinder. When the hydraulic pressure is released, the piston is returned to the bottom of the cylinder by two concentric coil springs within the latter. A hydraulic pressure of 180 psi is required to apply the reverse friction band—twice as much as that used to apply the low-gear band and to engage the clutch. The pressure is boosted to this value in the boost compartment of the pressure regulator valve. It may not be immediately apparent why a higher pressure should be required to apply the reverse band than the low-speed one, since the reduction ratios of both gears are the same, and both friction drums have the same diameter. The reason higher pressure is needed is that the torque reaction in reverse is much greater than that in low gear. Supposing the engine torque to be T, the transmission output torque in both cases will be 1.82 T. In low forward gear, where the output torque is in the same direction as the engine torque, there will be a reaction torque T on the engine block and only 0.82 T on the friction band and its anchor, whereas in reverse, where the output torque is in the opposite direction to the engine torque, there will be a torque reaction 2.82 T on the band and its anchor, This can be proved by reference to the drawings of the planetary assemblies, Figs 8 and 9. The tooth loads or pitch-line loads on all of the gears of a train are the same, and the torques on the various gears therefore are in direct proportion to their pitch radii. In the low-gear train the reaction member has a pitch radius equal to 0.82 that of the driving pinion, while in the reverse train the pitch radius of the reaction member (the ring gear) is 2.82 times that of the driving pinion.

Accumulators are inserted in the hydraulic lines to the low-gear friction-band servo and the direct-drive clutch. Their purpose is to admit oil to these devices at a rapid rate as long as there is no pressure within them, and then to cut down the rate of supply to insure a smooth pickup or a smooth tran-

(*Turn to page* 108, *please*)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sition from one range to the other. Combined with the accumulator is a dump valve, which insures rapid emptying of the clutch or servo cylinder when the hydraulic pressure is released.

The accumulator is a cylinder containing a piston which is acted on by a spring in one direction and by hydraulic pressure in the other. When oil is first admitted to the clutch or friction-band servo, it flows through two passages in parallel, one of which includes a small orifice in the head of the dump valve, while the other leads past a neck of the dump valve, through a recess on the piston, and through a port at the upper end of the accumulator. The combined area of these two passages is sufficiently large to cause the power cylinder to fill rapidly. Once that has been achieved, pressure begins to build up in the power cylinder and the line leading thereto. This pressure forces the piston in the accumulator down against its spring, and the upper land on the piston then closes the larger of the two passages through which oil has been entering the power cylinder. Thereafter it can enter only through the small metering orifice in the top of the dump valve, with the result that the pressure on, say, the clutch piston increases gradually, and clutch engagement is smooth. In addition to the small orifice at its top, the dump valve has two larger orifices at its neck, which serves to equalize the pressure above and below it. When the pressure in the line to the clutch is released by movement of the control lever, the larger area of the two orifices in the neck, as compared with that of the single one in the head of the dump valve, causes the pressure in the clutch to drop rapidly. Because the reverse is engaged only while the car is at a standstill, it needs no provision—such as an accumulator—to make it take hold smoothly.

One interesting feature which the Dynaflow shares with the electric drive as used on motor buses is that there is no interruption in the output torque when the change from low to high range is made. This is not inherent in the planetary gear, but is obtained by special provisions in the hydraulic control mechanism. In changing from low to high range, the low-speed friction band must be released and the high-speed clutch engaged, and it is apparent that it would not do to have periods of full clutch engagement and full band application overlap, as that would result in severe friction, heat generation, and mechanical stress at one or both members. A slight overlapping is desirable, because it prevents the engine from racing in case the shift is made at full or nearly full throttle, and also because it prevents interruption in the driving torque and jerky motion resulting therefrom. But during this period of overlap the force with which the friction band is applied must be strictly limited or controlled, so as to avoid the undesirable results mentioned in the foregoing. This effect is obtained by means of an anchor piston which is acted upon in one direction by the drag on the friction band, applied to it through a bell crank, and in the other direction by hydraulic pressure plus a spring.

When the control lever on the steering post is shifted from low to drive, fluid pressure is cut off from the power cylinder which applies the low-range friction band and directed instead to the power cylinder of the friction clutch. As the anchor piston is in the down position, the oil now can bypass the accumulator and a quick engagement can be arranged. For light or zero throttle operation where the spring force in the anchor piston is sufficient to keep the anchor in the up position, the oil is routed through the accumulator and a metered or slow application is obtained. This does not immediately release the band, because the pressure of the low-range circuit, plus the spring force, is applied also to the anchor piston (Fig. 10), raising the piston and keeping the band in contact with the drum, although the free end of the band has been released or allowed to withdraw by its servo. This condition, however, is maintained for

(*Turn to page* 110, *please*)

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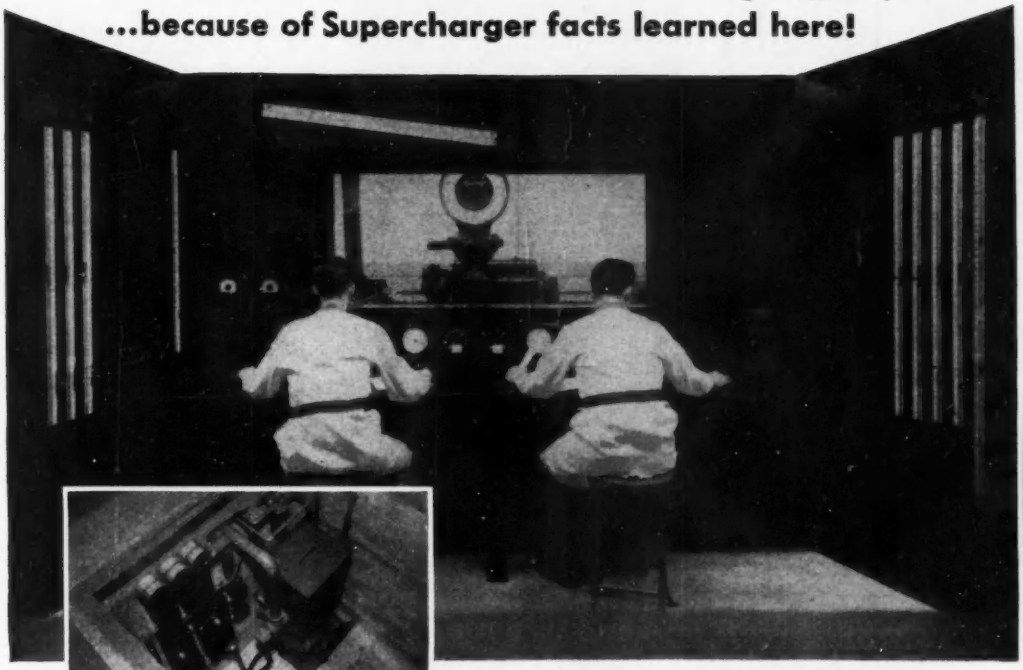

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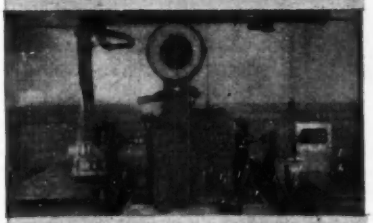

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only a short period, for as soon as the direct-drive clutch takes hold, the drum on which the low-gear band acts begins to turn in the opposite direction, and the resulting drag on the band releases it and returns the anchor piston to the off position.

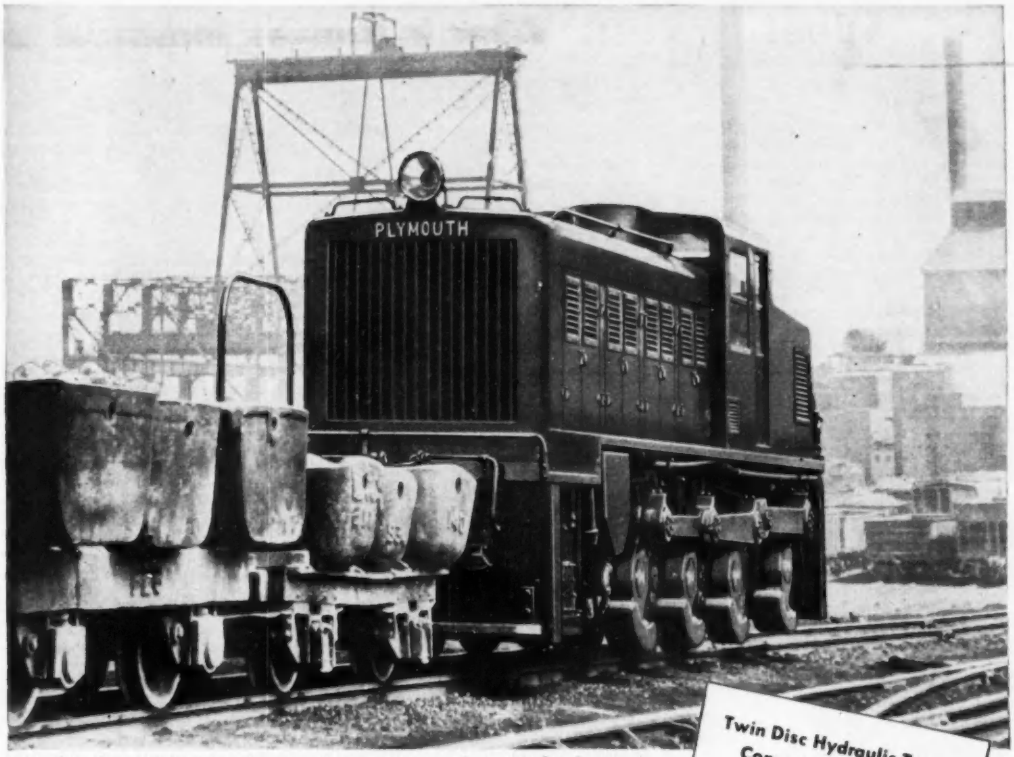
When the control lever is moved to the neutral position, the manual valve opens all of the power cylinders or servos to the sump, so that no power can be transmitted through the planetary unit. A switch acted upon by the control lever prevents engine starting when the lever is in any other than the neutral or parking position.

The control lever, which is similar to the ordinary shift lever but smaller, is mounted on the steering post. Directly in front of the steering post, in full view of the operator, is a control sector over which a pointer connected to the lever moves. There are five positions of the lever, corresponding to the following markings on the sector: P for parking, N for neutral, D for drive, L for low, and R for reverse. With the lever in the parking position the parking lock, of the positive or pawl type, is applied, while in the N position the direct-drive clutch is disengaged and the friction bands are released, so that all gears of the planetary assembly revolve idly.

Practically all driving is done with the lever in the D position. The planetary assembly is then locked up and provides a direct drive. In the L position the low-range friction band is applied and the direct-drive clutch released, and the output torque of the converter is then stepped up by the planetary unit in the proportion of 1 to 1.82. In the R position the direction of the drive is reversed and the converter output torque multiplied in the same ratio as in emergency low. The shift from low to high range or vice versa is ordinarily made without letting up on the accelerator pedal, except that it is inadvisable to change from high to low at speeds of over 40 mph, owing to the severe engine braking under these conditions.

When starting for a drive, the control lever will normally be in the P position, and after the engine has been started by stepping on the accelerator, the friction-type parking or emergency brake—if set—is released, the control lever is moved from the P to the D position, the accelerator pedal is pressed down, and the car starts off smoothly. It can be brought up to top speed by merely pressing the accelerator down all the way. To reverse, the control lever must first be raised (a safety measure) and then moved to the R position. However, for getting out of potholes or tight spots, the lever can be moved back and forth between the L and R positions at a suitable rate, with the accelerator only slightly depressed.

Part IX of this series on Modern Automatic Transmission will be published in an early issue of AUTOMOTIVE INDUSTRIES.



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What Is Russia's Industrial Strength

(*Continued from page* 41)

between 1945 and 1948. Next in scale have been the alleged increases in mineral production—copper, coal, petroleum, pig iron, lead and zinc—which ranged upward by an average of some 75 per cent from 1945 to 1949. Over the same period, grain output is said almost to have doubled. Even higher are the claims for construction materials: 106 per cent for timber, 317 per cent for cement. Increases in manufacturing top the list: they range from 117 per cent for cotton cloth to 964 per cent for tractors.

Two questions arise from these claims: Are they true? If so, how have the Soviets been able to achieve them?

It is my belief that the Soviet figures for increases in industrial production are inflated, as shown by the great disproportion between claimed advances in manufacturing as opposed to raw materials consumption, as independently estimated. Nevertheless, it is clear that the country's industrial output in 1949 had actually exceeded the 1940 level by a substantial margin. Thus mineral consumption in 1949 appears to have been almost 30 per cent higher than in 1940 (see Table III). Man-hour input by the total non-agricultural labor force (excluding members of the armed services) has increased by 27 per cent, as a result of increases both in numbers and in work hours. For industry excluding munitions, the corresponding increase is at least 30 per cent.

Estimates of changes in Soviet output for selected items are given in Table II. In general, these figures show important increases. Agricultural production, it is true, is still on the 1940 level or lower. Furthermore, consumer's goods, on which even conjectural statistics are lacking, seem in large part to have remained below prewar outputs. Finally, it must be stressed that productive *capacities* have not kept in step with output. Thus blast and open hearth furnace capacities in 1949 did not exceed those of 1937-40; locomotives and freight cars aggregate not more than two-thirds the 1940 numbers, although freight ton-mileage has recovered to the earlier level.

The mechanisms of Soviet recovery are generally explicable. Six factors appear to have been important. First was the unquantitative and, above all, qualitative improvement of the labor force resulting from the demobilization of the armed forces coupled with the maintenance of long work hours and rigorous labor controls. In addition, continued high employment of women, who formed 50 per cent of the non-agricultural labor force in 1949, plus the use of imported free and forced workers to an unknown degree, have enabled Russia to conscript its younger manpower into the armed services. Second, the Soviet Union has used its productive capacity at the highest level possible, especially so in 1949. The third factor has been substantial reconversion of a machine-tool stock which was relatively lightly damaged during the war and which was then augmented, certainly above prewar levels, by Lend Lease, war booty and reparations. The fourth has been the increased availability of many materials through wartime and postwar expansion of output, as noted previously; through territorial acquisitions, specifically potash and petroleum from Poland; and through importation from the satellite regions in Europe and Asia. For nine minerals, supplies available from these areas exceed Soviet domestic production. These minerals include antimony, barite, bismuth, bromine, cadmium, fluorspar, potash, talc and tungsten. Significant amounts of bauxite, beryllium, coal and lignite, cobalt, copper, gold, graphite, lead, magnesite, magnesium chloride, mer-

(*Turn to page* 114, *please*)

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PT	A4	—3	0—	.265	1.98	1.87	17.89	15.75	9.60	8.10	7.60	7.35
PT	A4	—5	0—	.390	1.99	1.88	18.03	15.88	9.68	8.18	7.68	7.43
PT	A5	—1	0—	.140	2.00	1.89	18.15	15.99	9.74	8.24	7.74	7.49
PT	A5	—3	0—	.265	2.03	1.92	18.40	16.21	9.86	8.36	7.86	7.61
PT	A5	—5	0—	.390	2.06	1.94	18.65	16.44	9.98	8.48	7.98	7.73
PT	A5	—7	0—	.515	2.18	2.06	19.77	17.43	10.50	9.00	8.50	8.25
PT	A6	—1	0—	.140	2.10	1.99	19.12	16.88	10.20	8.70	8.20	7.95
PT	A6	—3	0—	.265	2.14	2.03	19.50	17.21	10.38	8.88	8.38	8.13
PT	A6	—5	0—	.390	2.18	2.06	19.87	17.54	10.55	9.05	8.55	8.30
PT	A6	—7	0—	.515	2.26	2.15	20.72	18.32	10.97	9.47	8.97	8.72
PT	A6	—9	0—	.640	2.40	2.28	22.06	19.51	11.59	10.09	9.59	9.34
PT	A8	—3	0—	.265	2.49	2.39	23.17	20.55	12.16	10.66	10.16	9.91
PT	A8	—5	0—	.390	2.58	2.48	24.16	21.44	12.64	11.14	10.64	10.39
PT	A8	—7	0—	.515	2.69	2.59	25.24	22.42	13.15	11.65	11.15	10.90
PT	A8	—9	0—	.640	2.79	2.69	26.25	23.33	13.64	12.14	11.64	11.39

PULL-THROUGH MILD STEEL BRAZIER OR 100° C'SUNK HEAD

Part No. Type	Dia. In 32nds	Grip In 16ths	Material Thickness (Inches) From	To	Price Per 100: 100 to 499	500 to 999	Price Per 1000: 1,000 to 4,999	5,000 to 9,999	10,000 to 24,999	25,000 to 49,999	50,000 to 99,999	100,000 to 199,999
PT	R4	—1	0—	.140	2.47	2.37	22.95	20.33	12.04	10.54	10.04	9.79
PT	R4	—3	0—	.265	2.55	2.44	23.69	20.99	12.37	10.87	10.37	10.12
PT	R4	—5	0—	.390	2.62	2.51	24.34	21.56	12.68	11.18	10.68	10.43
PT	R5	—1	0—	.140	2.52	2.42	23.45	20.78	12.28	10.78	10.28	10.03
PT	R5	—3	0—	.265	2.60	2.49	24.20	21.46	12.63	11.13	10.63	10.38
PT	R5	—5	0—	.390	2.68	2.57	24.95	22.13	12.98	11.48	10.98	10.73
PT	R5	—7	0—	.515	2.75	2.64	25.69	22.80	13.33	11.83	11.33	11.08
PT	R6	—1	0—	.140	2.56	2.46	23.89	21.20	12.51	11.01	10.51	10.26
PT	R6	—3	0—	.265	2.60	2.50	24.29	21.56	12.70	11.20	10.70	10.45
PT	R6	—5	0—	.390	2.63	2.53	24.67	21.90	12.88	11.38	10.88	10.63
PT	R6	—7	0—	.515	2.75	2.65	25.89	23.01	13.47	11.97	11.47	11.22
PT	R6	—9	0—	.640	2.93	2.83	27.58	24.53	14.26	12.76	12.26	12.01
PT	R8	—3	0—	.265	2.99	2.90	28.43	25.31	14.69	13.19	12.69	12.44
PT	R8	—5	0—	.390	3.15	3.06	29.99	26.73	15.44	13.94	13.44	13.19
PT	R8	—7	0—	.515	3.32	3.23	31.71	28.27	16.25	14.75	14.25	14.00
PT	R8	—9	0—	.640	3.49	3.40	33.37	29.75	17.03	15.53	15.03	14.78

SELF-PLUGGING A17S-T ALUMINUM BRAZIER OR 100° C'SUNK HEAD

Part No. Type	Dia. In 32nds	Grip In 16ths	Material Thickness (Inches) From	To	Price Per 100: 100 to 499	500 to 999	Price Per 1000: 1,000 to 4,999	5,000 to 9,999	10,000 to 24,999	25,000 to 49,999	50,000 to 99,999	100,000 to 199,999
9SP	A4	—1	.019—	.140	2.07	1.96	18.90	16.70	10.12	8.62	8.12	7.87
9SP	A4	—3	.125—	.265	2.12	2.01	19.34	17.07	10.32	8.82	8.32	8.07
9SP	A4	—5	.250—	.390	2.16	2.05	19.76	17.46	10.52	9.02	8.52	8.27
9SP	A5	—1	.030—	.140	2.17	2.06	19.91	17.60	10.60	9.10	8.60	8.35
9SP	A5	—3	.125—	.265	2.23	2.13	20.53	18.15	10.89	9.39	8.89	8.64
9SP	A5	—5	.250—	.390	2.30	2.19	21.19	18.74	11.19	9.69	9.19	8.94
9SP	A5	—7	.375—	.515	2.42	2.30	22.26	19.68	11.69	10.19	9.69	9.44
9SP	A6	—1	.043—	.140	2.34	2.23	21.60	19.12	11.39	9.89	9.39	9.14
9SP	A6	—3	.125—	.265	2.44	2.32	22.49	19.91	11.81	10.31	9.81	9.56
9SP	A6	—5	.250—	.390	2.53	2.41	23.39	20.72	12.24	10.74	10.24	9.99
9SP	A6	—7	.375—	.515	2.63	2.52	24.40	21.63	12.71	11.21	10.71	10.46
9SP	A6	—9	.500—	.640	2.92	2.81	27.28	24.20	14.07	12.57	12.07	11.82
9SP	A8	—3	.125—	.265	3.39	3.27	31.88	28.33	16.24	14.74	14.24	13.99
9SP	A8	—5	.250—	.390	3.51	3.39	33.18	29.52	16.87	15.37	14.87	14.62
9SP	A8	—7	.375—	.515	3.61	3.50	34.32	30.57	17.44	15.94	15.44	15.19
9SP	A8	—9	.500—	.640	3.74	3.63	35.64	31.76	18.07	16.57	16.07	15.82

SELF-PLUGGING MILD STEEL BRAZIER OR 100° C'SUNK HEAD

Part No. Type	Dia. In 32nds	Grip In 16ths	Material Thickness (Inches) From	To	Price Per 100: 100 to 499	500 to 999	Price Per 1000: 1,000 to 4,999	5,000 to 9,999	10,000 to 24,999	25,000 to 49,999	50,000 to 99,999	100,000 to 199,999
9SP	R4	—1	.019—	.140	2.83	2.71	26.31	23.34	13.61	12.11	11.61	11.36
9SP	R4	—3	.125—	.265	2.93	2.81	27.31	24.22	14.07	12.57	12.07	11.82
9SP	R4	—5	.250—	.390	3.05	2.92	28.40	25.18	14.56	13.06	12.56	12.31
9SP	R5	—1	.030—	.140	2.93	2.82	27.43	24.35	14.14	12.64	12.14	11.89
9SP	R5	—3	.125—	.265	3.06	2.94	28.62	25.40	14.69	13.19	12.69	12.44
9SP	R5	—5	.250—	.390	3.19	3.07	29.86	26.51	15.27	13.77	13.27	13.02
9SP	R5	—7	.375—	.515	3.32	3.19	31.07	27.59	15.83	14.33	13.83	13.58
9SP	R6	—1	.043—	.140	3.05	2.94	28.67	25.47	14.74	13.24	12.74	12.49
9SP	R6	—3	.125—	.265	3.17	3.05	29.74	26.42	15.24	13.74	13.24	12.99
9SP	R6	—5	.250—	.390	3.26	3.15	30.77	27.37	15.74	14.24	13.74	13.49
9SP	R6	—7	.375—	.515	3.44	3.33	32.63	29.05	16.64	15.14	14.64	14.39
9SP	R6	—9	.500—	.640	3.84	3.72	36.46	32.46	18.42	16.92	16.42	16.17
9SP	R8	—3	.125—	.265	4.07	3.95	38.74	34.52	19.50	18.00	17.50	17.25
9SP	R8	—5	.250—	.390	4.24	4.13	40.58	36.19	20.38	18.88	18.38	18.13
9SP	R8	—7	.375—	.515	4.44	4.35	42.76	38.16	21.43	19.93	19.43	19.18
9SP	R8	—9	.500—	.640	4.63	4.52	44.54	39.78	22.29	20.79	20.29	20.04

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cury, molybdenum, petroleum, phlogopite mica, salt, uranium and zinc are also procurable from these peripheral territories. Finally, the sixth factor appears to have been a shift in the Fourth Five-Year Plan from a balance between reconstruction in the West and new investment in the East, to a concentration of effort largely on the West. Thus, while the planned construction of railroads, steel mills, and other industrial establisments, e.g., the Novosibirsk Automobile Plant in the East seems to be lagging, a number of new as well as reconstructed plants are in operation in the Ukraine and White Russia. In fact, most of Soviet recovery in 1948 can be ascribed to the revival of the Ukraine, as is evident from the following table:

Item	Percentage Increase 1948 over 1947	
	Entire USSR	Ukraine
Total output	27	45
Pig iron	22	41
Steel	28	74
Coal	14	22
Electrical power	16	43
Tractors	104	122
Caustic soda	25	49
Mineral fertilizers	43	72
Meat	25	34
Soap	45	96

Thus the balance of Societ industrial output is again shifting westward, a phenomenon of obvious political and military significance.

Conclusions and Comparisons

Russia's large population and substantial mineral wealth are cornerstones for major economic expansion in the future. On the other hand, limited agricultural resources and a presently inadequate transportation network are foreseeable bottlenecks. Although ample evidence of Soviet inventiveness exists, the nation's technological policy to date has been one of selective imitation of the West. Technological inadequacies, such as high waste and difficulties in model change, are manifest, but Russian technology is generally maturing at a rapid rate. Economic management in the Soviet Union is vigorous and purposeful, and especially characterized by the ability to mobilize the utmost of the country's human and material reserves for its purposes. The possibility of gross misdirection of effort is, however, always present in a dictatorial state.

In 1940, Russia's production was exceeded only by the United States and Germany. Its national income was possibly 40 per cent as great as the American, although its output of durable goods probably did not exceed one-fourth of ours. During World War II, extraordinary Soviet efforts, aided especially by Lend Lease, made possible a major war effort despite enormous losses of life and national wealth at German hands. In all, the Soviet Union, with a national income in 1944 a fifth of the American or less, produced 35-40 per cent as great a volume of munitions. Since the war, Russia has continued a tremendous campaign of production. By 1949, it had considerably surpassed its prewar levels of output, except in agriculture. But increases in productive capacity have lagged.

In comparison with the United States, Soviet production today is no greater relatively than in late prewar years, because American production has also risen. Per capita output is still very low by the standards of the West, as is shown in Table II. The satellite states are particularly impoverished. Thus, barring the recurrence of a great depression, the West is not confronted by a major challenge in peaceful production. But the memory of highly creditable Soviet war production between 1941 and 1945, coupled with postwar economic growth, and with Soviet capabilities of seizing the productive plant of continental Western Europe, forbids complacency toward the potential military challenge of Russia's economy.

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(*Turn to page* 116, *please*)

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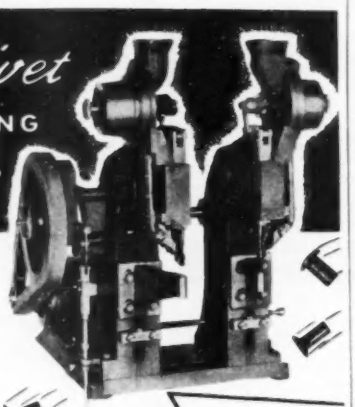

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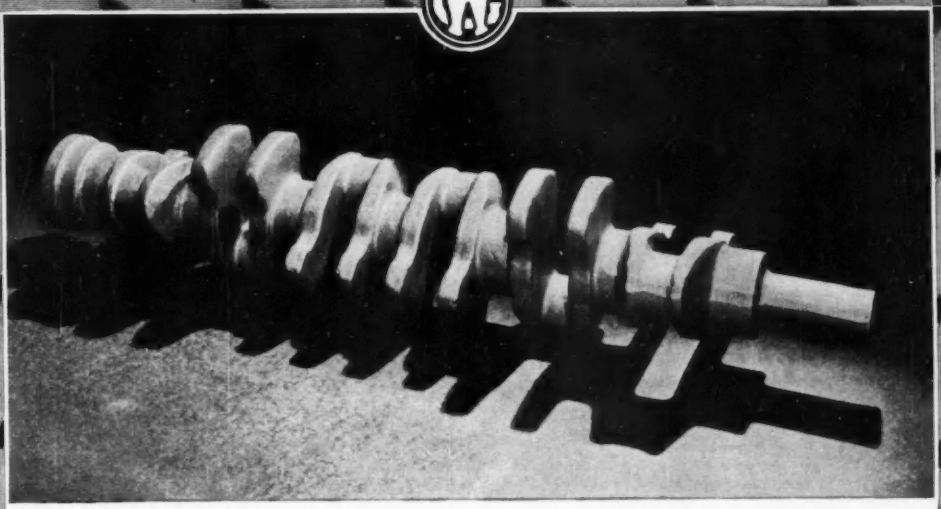

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Chrome Plating

(*Continued from page* 49)

First stage at the Eight-Mile plant is the press formation of the various stampings that make up the radiator grille. This is done in a series of operations in two batteries of five new presses, including a big Clearing for forming, and a succession of restrike and reforming steps in two 350-ton Danly presses, a 250-ton Danly press, and a 350-ton Clearing press.

As mentioned earlier, the plastic coating serves only to prevent marring of the polished surface. It is still necessary to coat each strip with drawing compound by passing through a coating roll.

Formed stampings now go through a washing machine to remove all traces of drawing compound and the plastic coating, in preparation for color buffing. Buffing is done automatically in

(*Turn to page* 118, *please*)

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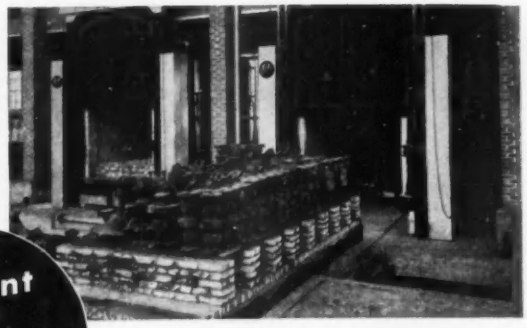

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the familiar type of merry-go-round machine fitted with wheel-heads capable of reaching the major areas of the work. Polishing of the end tips and some edges is completed by hand on the polishing jacks.

The stampings then enter the resistance welding conveyors where each piece receives certain fastenings, and finally the entire grille assembly is completed by welding in assembly jigs. Following inspection the grilles are placed on an overhead monorail conveyor for transport to the plating department.

As the parts travel on the conveyor they first traverse a long dip tank which aids in loosening the coating of buffing compound and dirt, prior to entering the enormous plating machine. The automatic chromium plating unit, built by Udylite, is about 150 ft long, of the familiar raise-and-dip automatic conveyor type. Starting with the electric cleaner tank at the loading end, work passes through a series of 12 sprays, rinses and immersions, including a four-minute dip in the chromium solution.

It may be noted that at the loading station the grille assemblies are mounted on two special anode racks, each one holding two grilles.

The specified thickness of chromium plate, 0.00001 in., demands unusually high current and ranges from 120-150 amp/sq ft in density.

As the parts come out of the plating machine they go through a drying operation with a hot rinse and blow-off at the exit end. Upon leaving the blow-off, parts are inspected and immediately packed in cartons ready for shipment to the customer's assembly plant.

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GERMAN-ENGLISH TECHNICAL DICTIONARY, Volume 1, A-K, edited by *Kurt F. Leidecker*, published by *S. F. Vanni*, 30 West 12 Street, New York, N. Y. Price $17.50. This dictionary contains the official translation of scientific terms found in the secret documents captured by the Allies after the fall of Germany. Its terminology has been adopted in the official documents of the Governments of both the U. S. and Great Britain and, as a consequence, by the industries of the two countries. This is said to be the first and only dictionary with the new scientific words. Volume 2 of this dictionary will cover L through Z and should be ready for publication by October, 1950.

ASTM SPECIFICATIONS FOR STEEL FLAT PRODUCTS, published by *American Society for Testing Materials*, 1916 Race Street, Philadelphia 3, Pa. Price $2.25. Materials covered in this book are widely used for structural purposes, and for boiler and pressure vessels. It includes 39 specifications for steel flat products, such as plate, sheet, strip, and related materials. For convenience, a number of the standards relating to stainless steel, wrought iron, and metallic coated sheets also are given.

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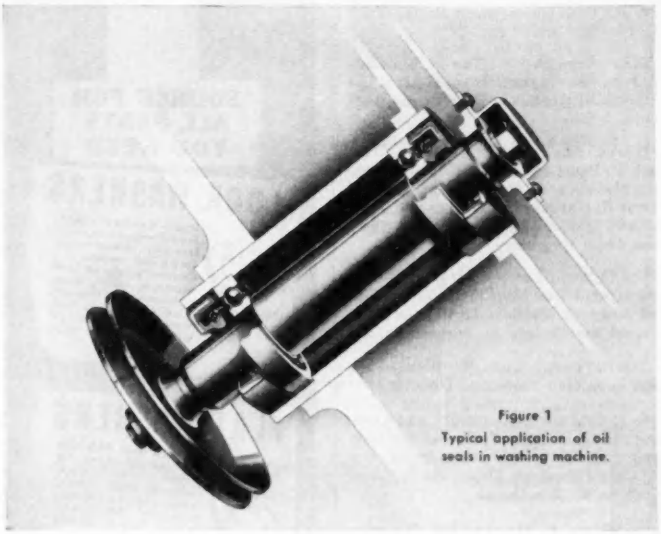

Figure 1
Typical application of oil seals in washing machine.

Zero leakage performance required of Oil Seals used in modern washing machines!

The bearing protection problems encountered in the new rotating tub-type washing machines are many and varied. A case in point is one in which the tub is set at a 30° angle and clothes are dried with high speed rotation. Thus bearings under angular thrust are subject to considerable shaft whip, particularly during the clothes-drying phase.

In this case (see Fig. 1), two ball bearing units spaced approximately six inches apart are employed on the main shaft. Space between bearings is partially filled with oil and the bearing housing at the top opens directly into the wash tub. Thus it is clear that the oil seals must be capable of zero leakage performance under completely flooded conditions.

Two National Syntech* Oil Seals are employed. One (Fig. 2), of unusual dual-lip design, is utilized in the top position. The upper lip on this seal protects the lower sealing lip from buttons, ravelings and soap residue, leaving it free to perform the main sealing function. The cavity between these two sealing lips retains sufficient lubricant for the seal during occasional dry operating periods. The lower sealing lip is accurately spring-tensioned to provide 100% protection from the water.

*Trade Mark registered

Figure 2

The oil seal at the bottom position (Fig. 3) is of conventional design mounted in regular manner, with lip facing the bearing to retain lubricant. All metal parts of these seals are completely rubber covered as a protection against rust.

National Syntech* Oil Seals are ideal for this purpose. They are unaffected by exposure to water and the strong detergents used in these machines and, they have demonstrated their ability to operate at zero leakage for long periods under flooded conditions. The characteristic flexibility of these seals compensates for the eccentric shaft stresses encountered.

Figure 3

Dependability is of signal importance in home appliances since they are often required to perform for long periods with no particular attention to maintenance. National Syntech* seals are daily demonstrating their dependability and efficient performance in applications of this kind. Many times you will find your sealing problem can be solved by employing an existing National Oil Seal design. If special designs are required, however, National engineers will be happy to help you develop them.

"Let Your Decision be Based on Precision"

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2072

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MEN *in the* NEWS

(*Continued from page* 25)

sistant Sales Manager, has been announced.

General Electric Co.—**Willard R. Barrett** has been named Sales Manager for the Plastics Div.

Ethyl Corporation—The appointment of **John B. Taylor, Jr.,** as Assistant Director of Research, Detroit, has been made.

Warner Div., Clinton Machine Co.—**Jack P. Pedersen** has been named General Manager of the division. **Colonel Oliver K. Gardner** has been named Asst. to the President and **Clarence A. Sherman,** Chief Engineer.

The Baldwin Locomotive Works—Announcement has been made of the appointment of **Malcolm L. Hall** as Manager of the Testing Equipment Dept.

Detrex Corp.—**Phil H. Richey** has been appointed Personnel Director.

E. I. du Pont de Nemours and Company, Inc.—**Dr. Max T. Goebel** has been appointed Technical Director of the Grasselli Chemicals Dept. He succeeds **Dr. John C. Woodhouse.**

The Glenn L. Martin Co.—The election of **Richard L. Johnson** as Vice-Pres.-Finance and **Jess W. Sweetser** as Vice-Pres.-Sales has been announced.

Pacific Airmotive Corp. — **Thomas Wolfe** has been elected President of the Burbank, Calif., Company.

Carboloy Company, Inc.—**Kenneth R. Beardslee** has been named President, succeeding the late **Walter G. Robbins. Eugene F. Wambold** has been made Executive Vice-President in charge of manufacturing, engineering, employee and community relations and purchasing, a newly created position.

Micromatic Hone Corp.—**George Eldred** has been appointed Abrasive Sales Manager.

The deHavilland Aircraft Co., Ltd.—The retirement of **A. S. Butler** from the Chairmanship of the Board, has been announced.

Redmond Co., Inc. — **Glenn Baumhardt** has been named Vice-President in Charge of Engineering, replacing Paul Maurer.

Caterpillar Tractor Co.—The appointment of **H. J. Hunkele, Jr.,** as Asst. Manager of Sales Engineering Div., has been announced.

The National Acme Co.—**R. C. Kinley,** Vice-Pres. and Works Manager has announced his retirement. Succeeding him is **B. H. Ayers.** Succeeding Mr. Ayers as General Supt. is **John L. Molner.**

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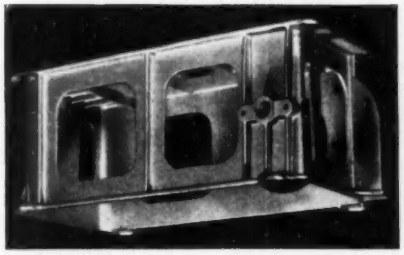
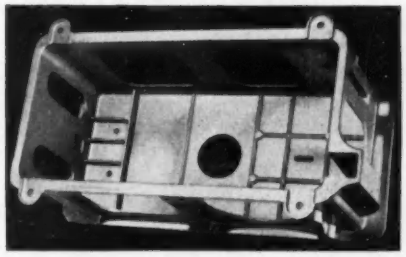


Complicated Coring?



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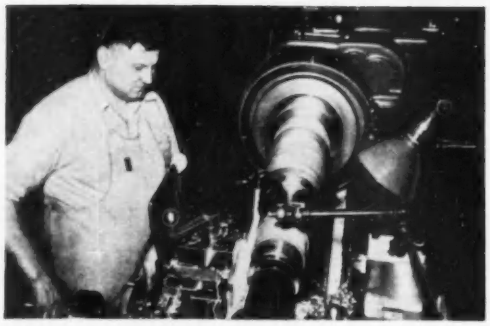

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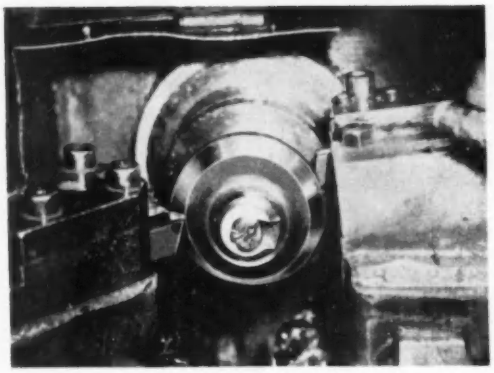

3 Highest *plant-wide* average production per machine

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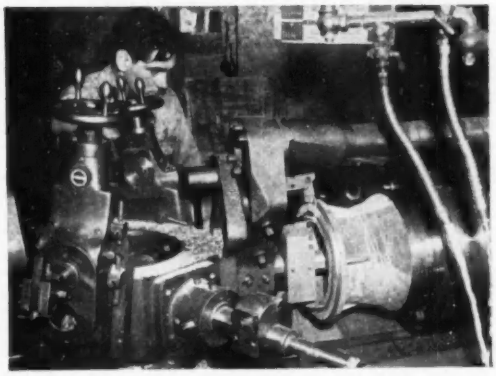
*Midwest manufacturer**



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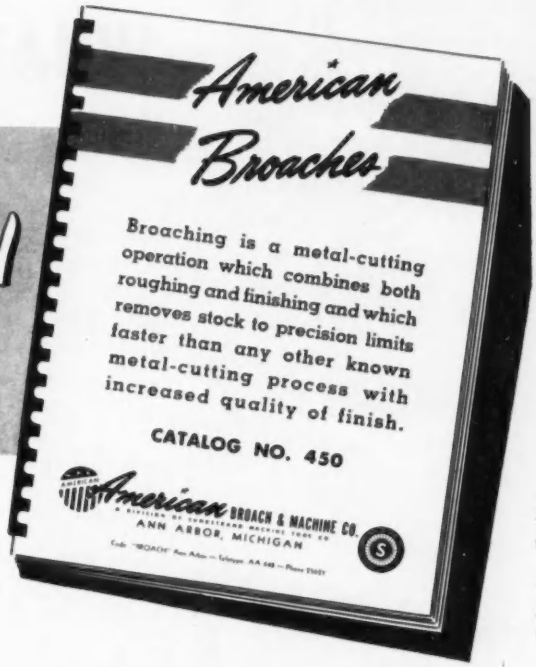
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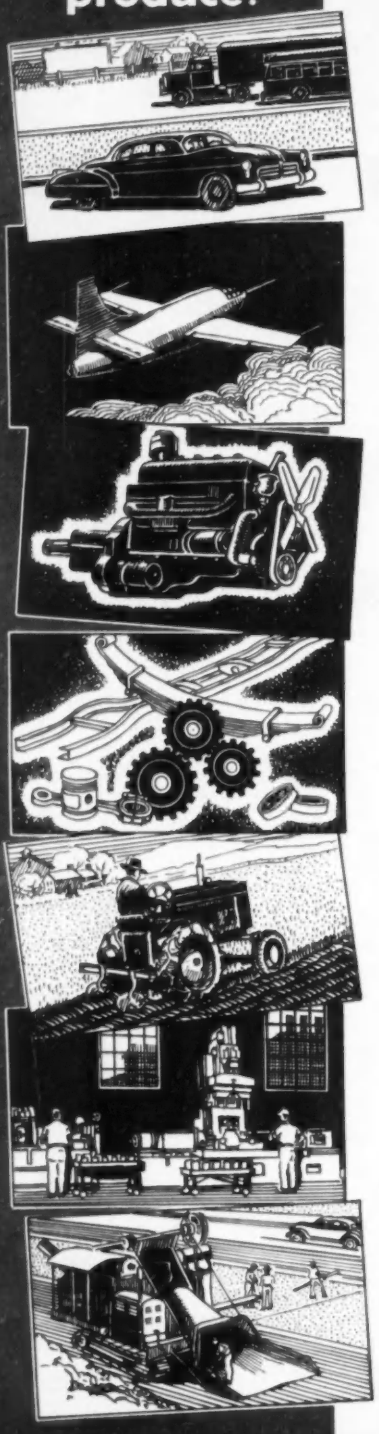

WHAT DO WE MEAN "automotive industries?"

Answer: *The nation-wide industries that manufacture passenger cars, trucks, buses, tractors, gasoline, diesel and jet engines, aircraft parts, accessories, automotive materials, supplies and production equipment, farm and road-working equipment, petroleum products, automotive shop equipment.*

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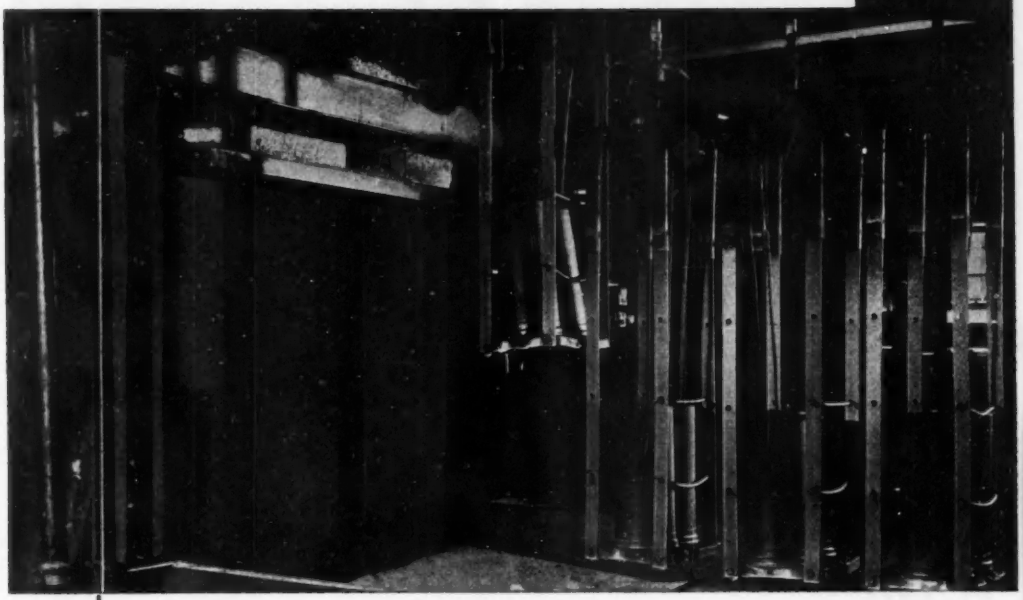

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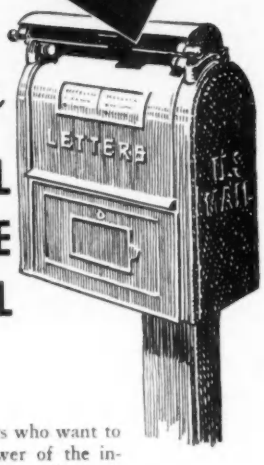

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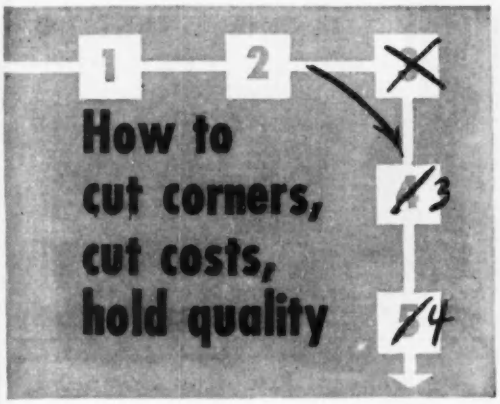

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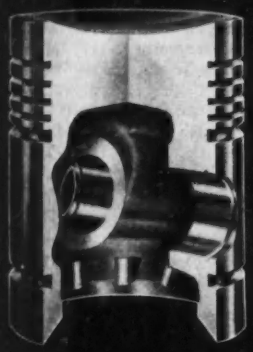

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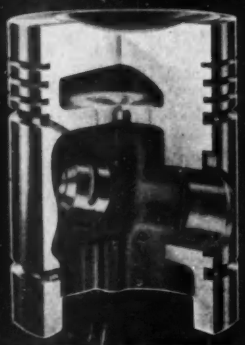

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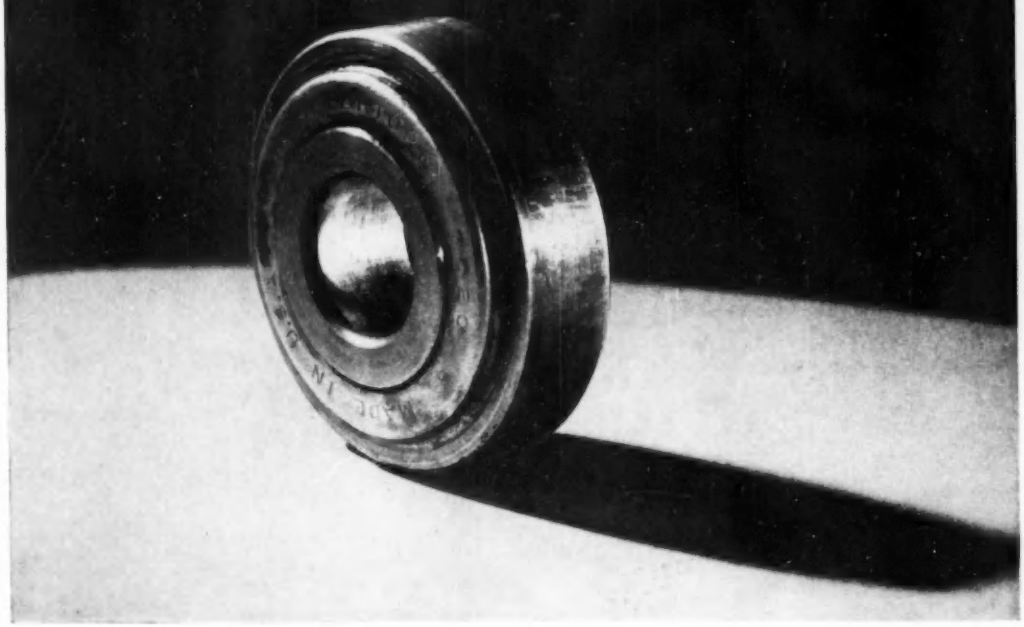


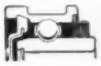
This self-sealed ball bearing, one of the earlier types originated by New Departure, was removed and examined in the twentieth year of its service in a grinder. No appreciable wear had occurred and the internal fit-up was still *well within* the tolerances of a new bearing.

While this is eminently satisfactory, but not unusual service, it points up the significant fact that for assured performance, for the ability to eliminate periodic adjustments and to reduce lubricating or other maintenance to the simplest possible terms, the ball bearing is *outstanding*.

It was full knowledge of the distinctive advantages of the ball bearing that led New Departure to pioneer and develop the self-sealed bearing, including many lubricated-for-life types, some of which are illustrated at each side.

This hard worked "Granddaddy", progenitor of a famous family, thus started a trend that has required New Departure to produce more than 159 million self-sealed ball bearings to date.

Data covering ball bearing dimensions, application, lubrication and other subjects gladly sent upon request.



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